



**Calhoun: The NPS Institutional Archive**  
**DSpace Repository**

---

Theses and Dissertations

1. Thesis and Dissertation Collection, all items

---

1995-06

# Flying hour program: a model approach for the Colombian Air Force

Suarez M., Carlos A.

Monterey, California. Naval Postgraduate School

---

<http://hdl.handle.net/10945/31494>

---

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

*Downloaded from NPS Archive: Calhoun*



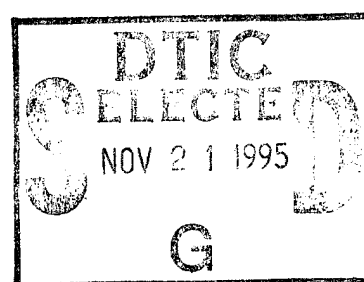
Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

**Dudley Knox Library / Naval Postgraduate School**  
**411 Dyer Road / 1 University Circle**  
**Monterey, California USA 93943**

<http://www.nps.edu/library>

# NAVAL POSTGRADUATE SCHOOL

## Monterey, California



### THESIS

#### FLYING HOUR PROGRAM: A MODEL APPROACH FOR THE COLOMBIAN AIR FORCE

by

Carlos A. Suarez M.

June, 1995

Thesis Advisor:

Jerry McCaffrey

Approved for public release; distribution is unlimited.

19951116 099

DTIC QUALITY INSPECTED 5

<b>REPORT DOCUMENTATION PAGE</b>			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
<b>1. AGENCY USE ONLY (Leave Blank)</b>	<b>2. REPORT DATE</b> June, 1995	<b>3. REPORT TYPE</b> Master's Thesis		
<b>4. TITLE AND SUBTITLE</b> FLYING HOUR PROGRAM: A MODEL APPROACH FOR THE COLOMBIAN AIR FORCE			<b>5. FUNDING NUMBERS</b>	
<b>6. AUTHOR(S)</b> Carlos A. Suarez M.				
<b>7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)</b> Naval Postgraduate School Monterey, CA 93943-5000			<b>8. PERFORMING ORGANIZATION REPORT NUMBER</b>	
<b>9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)</b>			<b>10. SPONSORING/MONITORING AGENCY REPORT NUMBER</b>	
<b>11. SUPPLEMENTARY NOTES</b> The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the United States Government.				
<b>12a. DISTRIBUTION/AVAILABILITY STATEMENT</b> Approved for public release; distribution is unlimited.			<b>12b. DISTRIBUTION CODE</b>	
<b>13. ABSTRACT ( Maximum 200 words )</b>  This thesis examines the Flying Hour Program (FHP) as it is employed in the air components of the branches of the US military and as it is currently employed in the budgeting process of the Colombian Air Force (CAF). Key steps, players, and purposes of the program are explored. Close examination of the program in the US Navy allows for the identification of procedures that might be useful in the budgeting process of the CAF, which is currently undergoing a migration toward automated information systems. Reliance on information systems technology and participation at all levels, makes the US Navy FHP an attractive model for the CAF in improving its own FHP. This thesis outlines key factors to be considered in the implementation process within the CAF.				
<b>14. SUBJECT TERMS</b> Flying Hour Program (FHP), Planning Programming and Budgeting System (PPBS), Colombian Air Force (CAF)			<b>16. PRICE CODE</b>	
			<b>15. NUMBER OF PAGES</b> 94	
<b>17. SECURITY CLASSIFICATION OF REPORT</b> Unclassified	<b>18. SECURITY CLASSIFICATION OF THIS PAGE</b> Unclassified	<b>19. SECURITY CLASSIFICATION OF ABSTRACT</b> Unclassified	<b>20. LIMITATION OF ABSTRACT</b> UL	
NSN 7540-01-280-5500			Standard Form 298 (Rev. 2-89)	



Approved for public release; distribution is unlimited.

**FLYING HOUR PROGRAM: A MODEL APPROACH FOR THE COLOMBIAN  
AIR FORCE**

Carlos A. Suarez M.  
Lieutenant Colonel, Colombian Air Force  
MS in Logistics Management, Florida Institute of Technology

Submitted in partial fulfillment of the  
requirements for the degree of

**MASTER OF SCIENCE IN RESOURCE PLANNING AND MANAGEMENT FOR  
INTERNATIONAL DEFENSE**

from the

**NAVAL POSTGRADUATE SCHOOL  
June, 1995**

Author:

Carlos A. Suarez M.

Approved by:

Jerry McCaffrey, Thesis Advisor

Kenneth Euske, Second Reader

David Whipple, Chairman  
Department of Systems Management

Accession For	
NTIS	CRA&I <input checked="" type="checkbox"/>
DTIC	TAB <input type="checkbox"/>
Unannounced <input type="checkbox"/>	
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	



## **ABSTRACT**

This thesis examines the Flying Hour Program (FHP) as it is employed in the air components of the branches of the US military and as it is currently employed in the budgeting process of the Colombian Air Force (CAF). Key steps, players, and purposes of the program are explored. Close examination of the program in the US Navy allows for the identification of procedures that might be useful in the budgeting process of the CAF, which is currently undergoing a migration toward automated information systems. Reliance on information systems technology and participation at all levels, makes the US Navy FHP an attractive model for the CAF in improving its own FHP. This thesis outlines key factors to be considered in the implementation process within the CAF.



## TABLE OF CONTENTS

I. INTRODUCTION .....	1
A. OBJECTIVES AND SCOPE .....	2
B. RESEARCH QUESTIONS.....	3
C. METHODOLOGY .....	3
D. ORGANIZATION OF THESIS.....	4
II. THE US ARMED SERVICES FLYING HOUR PROGRAM.....	5
A. THE PLANNING-PROGRAMMING-BUDGETING SYSTEM (PPBS) .....	5
1. Planning .....	6
2. Programming.....	7
3. Budgeting.....	7
B. THE FLYING HOUR PROGRAM (FHP) .....	8
C. DEVELOPMENT OF NEEDS FOR SUBMISSION AND APPROVAL.....	9
1. The FHP in the Air Force.....	9
2. The FHP in the Army.....	13
3. The FHP in the Navy .....	17
D. FLYING HOUR PROGRAM COSTS .....	21
III. MANAGEMENT OF THE US NAVY FHP .....	27
A. KEY PLAYERS.....	27
B. MANAGING THE BUDGETARY PROCESS .....	28

C. MANAGING THE EXECUTION OF THE FHP .....	29
D. MANAGEMENT INFORMATION SYSTEMS .....	31
E. MEASUREMENT OF PERFORMANCE AND VARIATIONS .....	37
IV. BUDGETING IN THE COLOMBIAN AIR FORCE .....	41
A. THE BUDGETING PROCESS .....	42
1. Constitutional Provisions .....	42
2. The Ministry of Defense .....	44
B. THE BUDGETING PROCESS AND THE FHP IN THE COLOMBIAN AIR FORCE .....	47
1. Needs Analysis .....	48
2. Quantification of Demands .....	50
3. Executing and Implementing the FHP .....	51
V. PROPOSED MODEL FOR THE COLOMBIAN AIR FORCE FHP .....	55
A. PLANNING APPROACH .....	55
1. Assumptions .....	56
2. Environment .....	56
3. Organizational Mission .....	58
B. FRAMEWORK OF THE MODEL AND ITS COMPONENTS .....	58
1. Planning .....	59
2. Information Base .....	61

3. Structure .....	63
4. Needs Analysis.....	64
5. Control Systems .....	65
6. Personnel.....	67
C. TRANSITION AND INTERVENTION.....	67
VI. CONCLUSION.....	71
A. SUMMARY OF FINDINGS .....	71
1. US Air Components.....	71
2. The CAF.....	72
B. RECOMMENDATION .....	73
C. SUGGESTIONS FOR FUTURE RESEARCH .....	73
LIST OF REFERENCES.....	75
INITIAL DISTRIBUTION LIST.....	79



## LIST OF ACRONYMS

<b>AFCC</b>	Air Force Cost Center
<b>AFCS</b>	Air Force Chief of Staff
<b>AFHQ</b>	Air Force Headquarters
<b>AFM</b>	Aviation Fleet Maintenance
<b>AFR51-51</b>	Air Force Regulation 51-51
<b>AFTC</b>	Air Force Technical Chief
<b>AIMD</b>	Aircraft Intermediate Maintenance Department
<b>AMF</b>	Aircrew Manning Factor
<b>AOM</b>	Aircraft Operations Maintenance
<b>ASD</b>	Average Sortie Duration
<b>ASKIT</b>	Aviation Storekeeper Information Kit
<b>ASO</b>	Aviation Supply Office
<b>AVLDR</b>	Aviation Depot Level Repairable
<b>BCM</b>	Beyond the Capability of local Maintenance
<b>BES</b>	Budget Estimated Submission
<b>BOR</b>	Budget Operating Reports
<b>CANDE</b>	Computer Aided NAVFLIRS Data Entry
<b>CAF</b>	Colombian Air Force
<b>CNO</b>	Chief of Naval Operations
<b>COMNAVAIRLANT</b>	Commander Naval Air Forces US Atlantic Fleet
<b>COMNAVAIRPAC</b>	Commander Naval Air Forces US Pacific Fleet
<b>CFH</b>	Cost Per Flight Hour
<b>CSR</b>	Crew Seat Ratio
<b>DoD</b>	Department of Defense
<b>DoN</b>	Department of the Navy
<b>DOP</b>	Designated Overhaul Point
<b>DPG</b>	Defense Planing Guidance
<b>DRPB</b>	Defense Resource Planning Board
<b>FAADCLNAT/PAC</b>	Fleet Accounting Redistribution Center Atlantic and Pacific
<b>FHCAS</b>	Flying Hour Cost Analysis System
<b>FHC</b>	Flying Hour Cost
<b>FHCR</b>	Flying Hour Cost Report
<b>FHP</b>	Flying Hour Program
<b>FYPD</b>	Future Years Defense Plan
<b>FYTD</b>	Fiscal Year To Date
<b>GAO</b>	General Accounting Office
<b>GCC</b>	Graduate Combat Capability Tables
<b>GDP</b>	Gross Domestic Product
<b>HELMS</b>	Headquarters Expense Limitation Management System
<b>H/C/M</b>	Hours per Crew per Month
<b>HQDA</b>	Headquarters Department of the Army

<b>IMA</b>	Intermediate Maintenance Activity
<b>IDA</b>	Institute for Defense Analysis
<b>IS</b>	Information Systems
<b>JCS</b>	Joint Chiefs of Staff
<b>JSPD</b>	Joint Strategic Planning Document
<b>MAC</b>	Military Airlift Command
<b>MAF</b>	Maintenance Action Form
<b>MAJCOM</b>	Major Command
<b>MDCS</b>	Maintenance Data Collection System
<b>MTIS</b>	Material Turned Into Stores
<b>NALCOMIS</b>	Naval Aviation Logistics Command Maintenance Information System
<b>NADEP</b>	Naval Aviation Depots
<b>NAVCOMPT</b>	Navy Comptroller
<b>NAVFLIRS</b>	Naval Flight Record Subsystem
<b>NPS</b>	Naval Postgraduate School
<b>NSF</b>	Navy Stock Fund
<b>OB</b>	Operating Budget
<b>O&amp;M</b>	Operations and Maintenance
<b>ODCSOPS</b>	Deputy Chief of Staff for Operations and Plans
<b>OFC</b>	Operational target Functional Categories
<b>OMA</b>	Organization Maintenance Activity
<b>OMB</b>	Office of Management and Budget
<b>OP-05E</b>	Special Assistant for the Flying Hour Program
<b>OP-5/-32</b>	Operational Report 5/-32
<b>OP-20</b>	Operations Plan 20
<b>OP-82</b>	Flying Hour Program Budget Analyst
<b>OPTAR</b>	Operating Budget Target
<b>OPTEMPO</b>	Operating Tempo
<b>OSD</b>	Office of the Secretary of Defense
<b>PAA</b>	Primary Authorized Aircraft
<b>PBD</b>	Program Budget Decision
<b>PCMT</b>	Personal Computer Message Transmission
<b>PDM</b>	Program Decision Memorandum
<b>PMA</b>	Primary Mission Area
<b>PMR</b>	Primary Mission Readiness
<b>POL</b>	Petroleum, Oil, and Lubricants
<b>POM</b>	Program Objective Memorandum
<b>PPBS</b>	Planning, Programming, and Budgeting System
<b>ROC/POE</b>	Required Operational Capability/Projected Operational Environment
<b>SAC</b>	Strategic Air Command
<b>SECDEF</b>	Secretary of Defense
<b>SOFDL</b>	Summary of Filled Order Expenditures Difference Listing

<b>SORTS</b>	Status of Resources and Training System
<b>SSC</b>	Supply Support Center
<b>TAF</b>	Tactical Air Force
<b>TYCOM</b>	Type Commander
<b>T/M/S</b>	Type, Model, Series of aircraft
<b>USAF/FM</b>	US Air Force Financial Management Office
<b>USAFHQ/XOOTW</b>	Air Force Flying Hour Programmers
<b>TEC</b>	Type Equipment Code
<b>TRIX</b>	Training and Readiness Matrix
<b>UADPS</b>	Uniform Automated Data Processing System
<b>VIDS/MAF</b>	Visual Information Display System/ Maintenance Action Form
<b>3M</b>	Aviation Maintenance and Material Management System

## I. INTRODUCTION

National security is the public good that the armed forces are responsible to provide. To accomplish its part on this mandate, the Air Force must have sufficient capability to face a given threat. Aircraft and aircrew readiness are considered the essential means to meet goals and requirements established even in times of fiscal austerity. This paper intends to determine the driving factors for obtaining the financial resources required to acquire and to maintain the Air Force main components.

Availability of aircraft and proficiency of aircrews are dependent on allocation of funds. The basic expectation is to obtain a high level of performance when operating air weapon systems. A combat mission capability results from continuing training and events delineated for each particular type of mission. Logistic resources must be adequately quantified in a coordinated budget process that is ready to support the aircraft and their employment.

The US armed services use a definite model for preparing and executing the budget for air operations in what is called the Flying Hour Program (FHP). This program works under the Planning, Programming and Budgeting System (PPBS) in use since 1961, that has served the policy development and planning needs of the Department of Defense (DoD) resource decision making. Program decisions are made on the basis of assessing alternatives and quantitative data are available to application of analytical methodologies. Inputs and outcomes are measured by diverse levels of management within a framework of coherence and integration. It will be assumed that the basis of this program could be successfully adapted to other similar environments such as in the Colombian Air Force (CAF).

The CAF confronts several challenges in obtaining, managing, and controlling financial resources for its efficient operation. Competition with the other armed services as well with other government agencies for its budget share is always present. Funds are generally insufficient to cover the operational requirements it has to meet. Long-term perspectives are required when developing the budget. Operational and managerial

processes have to be coordinated and integrated. Flexibility is essential to adapt to changing conditions in equipment and personnel. Accurate information to justify requirements must be easily available for decision making.

Currently, the CAF is in the process of changing its manual information system to one based on automation. The methods and procedures developed for projection of needs, costs and prices rely on historical data and managerial experience. This technological change implies to some extent redefinition of interrelations between the organizational factors involved such as structure, personnel, tasks, and systems/processes.

## **A. OBJECTIVES AND SCOPE**

This research paper will address the topic of budget management, specifically the use of an FHP to enhance the capability of military air organizations to meet operational and fiscal requirements. The thesis will focus on the identification of factors required to justify and obtain proper allocation of funds, as well as those elements necessary for effective implementation of an FHP, and will highlight the specific components of the FHP as employed in the US that are conducive to application in the CAF.

This research is intended to provide a better understanding of the budgeting process for flight operations. It will bring a basis for discussion and improvement of the planning processes currently followed in the CAF. The study will identify specific factors to consider in budget formulation and the relevant activities and quantitative data to support requirements. The integration of functions and information in the operational and administrative fields will be also addressed in order to facilitate the execution and permanent evaluation of the program.

The study will concentrate on the development of the FHP. It will examine the models followed by the US armed services, the basic factors and components considered for planning, programming and execution of those resources involved in the process. A consideration of existing policies and regulations that support such practices will likewise be undertaken. The study will determine what elements could be successfully adapted in a model to improve the budget formulation process currently applied in the CAF and in

its modernization program. The model will provide a framework of the main components, variables and activities that are involved in the formulation, execution and evaluation of the FHP.

## **B. RESEARCH QUESTIONS**

The research questions for this thesis include:

1. How to derive a model that establishes the budgetary resources required to develop a FHP for the CAF based on experiences obtained from the models developed in the US armed services?
2. How is the FHP budget prepared, submitted, and executed within the US armed services?
3. How are FHP requirements determined for further translation into budget requests in the US armed services?
4. What are the costs involved in calculating the needs for the FHP?
5. What elements from the FHP in the US armed services would be feasible for adoption in the CAF in order to improve the process currently used by the CAF?

## **C. METHODOLOGY**

Historical data was used for this study as well as reports, previous theses, studies on the issue, publications from governmental agencies, and other unclassified documents. Texts, notes and reference material from courses taken by the author at the Naval Postgraduate School (NPS) were consulted. Interviews with officials with knowledge and experience in managing this type of program and similar models developed were utilized.

Data on the CAF description model was drawn upon from the experience of the author while working on the budgeting process for the CAF for seven years. The author worked extensively in the financial department, staffing positions, and managing other related projects.

## **D. ORGANIZATION OF THESIS**

The thesis is divided into six chapters. Chapter I presents an overview of the FHP as practiced in each of the branches of the US armed services. Chapter II focuses on the FHP in the US Navy, and illustrates the role of key individuals and organizations in the budgeting process. Chapter III discusses the current budgeting process in the Colombian Air Force. Chapter IV presents the key issues to be addressed in reformulating the FHP in the CAF. Chapter V presents conclusions and recommendations.

## **II. THE US ARMED SERVICES FLYING HOUR PROGRAM**

The purpose of this chapter is to introduce the FHP as it is employed by the air components of the US armed forces. The first section of the chapter describes the PPBS, within which the FHP exists. This is followed by a general discussion of the FHP itself. The third section of the chapter discusses the determination of needs in each branch of service, while the fourth and final section concerns FHP costs.

### **A. THE PLANNING-PROGRAMMING-BUDGETING SYSTEM (PPBS)**

Budgets are used to propose expenditures for certain human purposes or policy objectives over a given period of time, and are intended to account for anticipated future events. Only through observation is it possible to determine the degree to which predictions devised in the budget document turn out to be correct. Since funds are limited in relation to policy goals, the budget becomes a mechanism for making choices among alternative expenditures (Ref. 1, p. 3-4). In 1961, the PPBS was introduced in the DoD by Secretary Robert McNamara as a decision making tool for allocating resources to competing demands.

This system, which is based on program budgeting, has the following major features:

- The definition of specific objectives.
- The determination of major issues to be resolved in the formulation of these objectives.
- The study of possible alternatives through which to achieve these objectives.
- A definite schedule that allows appropriate time for analysis and decision making at all levels of management.
- The continuous examination of program results in relationship to anticipated costs and outcomes.
- The development of analytical tools for measuring costs and benefits.

- The design of a multi-year program and financial plan for the future.
- The adaptation of existing accounting and statistical reporting systems to provide initial inputs and continuing information on resources consumed and actions taken to implement programs (Ref. 2, p. 6).

Despite criticism and subsequent variations in the system, the basic principles are still in use in the DoD. The process was specifically developed to deal with problems encountered in the defense sector, where many program and budget decisions are made by assessing alternatives on the basis of quantitative data available to the application of analytical methodologies. The PPBS produces budget requests for defense on a regular and reliable schedule, and provides a highly organized context for policy negotiation and decision making in the service branches and the DoD (Ref. 3).

The PPBS produces not only a biennial budget for congressional consideration, but also a long term defense plan for the following six years, known as the Future Years Defense Plan (FYDP). Moreover, policy and programmatic planning takes a long range perspective of more than 10 years, while programming has a six year focus (as does budgeting). Within this outlook, each of the three distinct phases of the PPBS -- planning, programming, and budgeting -- produces a specific product.

## **1. Planning**

The policy development and planning phase of PPBS is designed to integrate assessments of potential threats, international interests and commitments, and the programmatic objectives and defense policy set by high level officials. Each military department estimates the resources needed to meet threats and commitments within certain levels of risk, and the Joint Chiefs of Staff (JCS) deliver a document called the Joint Strategic Planning Document (JSPD). The final outcome of the process is the Defense Planning Guidance (DPG), which combines the independent evaluations and provides official guidance to the military services and the basic rationale for DoD programs and budgets in the next FYDP (Ref. 4, p. 26). In short, planning articulates the amount of resources needed to minimize threats independent of resource constraints in

such a way that choices among alternative force structures and threat responses may be examined during the programming and budgeting phases of PPBS.

## **2. Programming**

The programming phase is guided by the FYDP, which provides a summary of requirements and alternatives for achieving readiness, force structure, sustainability, and modernization objectives. In this phase, each military service prepares a Program Objective Memorandum (POM), reflecting the specific force levels and programs proposed over the FYDP period to meet the requirements identified in the DPG within the financial limits established by the Secretary of Defense (SECDEF). The Defense Planning Guidance "provides the components of the DoD with the policy, force, and fiscal guidance needed to construct their program proposals and ultimately their annual budgets." (Ref. 5, p C-13 in T1-9). The task of programming is to articulate and prioritize six year defense resource demands in the perspective of a moving two year cycle. The POMs are merged with views from the JCS as expressed in the Joint Program Assessment Memorandum. Later, they are analyzed and reviewed by the Defense Resource Planning Board (DRPB) under the direction of the Secretary of Defense. When the DRPB makes final decisions about service plans, a Program Decision Memoranda is set, establishing the framework for the following two fiscal years. Programming differs between service branches, but in general it comprises three phases: program planning and appraisal, program development, and program decision and appeals in the form of what are commonly called "reclamas". The services differ in the degree of centralization and assignment of responsibility for reviews.

## **3. Budgeting**

During the budgeting phase, the primary effort is to ration resources across and within the military departments in accordance with previous planning and programming decisions. This phase is a fairly technical exercise in which earlier budget allocations, in terms of program elements, are restructured for submission to Congress according to appropriations accounts. Policy and resource planning within the PPBS program

structure comprises eleven programs. These programs are subsequently translated to the appropriations format employed by the Congressional budget process, which is composed of seven major account titles.

Budget formulation requires the issuance of preparation guidelines, the assembling of programmatic and cost data, the provision of opportunities for program justification in hearings, the analysis of proposals for adherence to regulations, and the negotiation of program priorities within the constraints of the budget authority projected to be available for the period in consideration. Budgeting is a highly constrained exercise in pricing the programs within the parameters of availability and political feasibility.

The FHP is within one of the eleven programs within the PPBS, and the managers of the FHP must comply with the procedures mandated by PPBS (Ref. 6, p. 8).

## **B. THE FLYING HOUR PROGRAM (FHP)**

The FHP is one of the programs competing for resources within the PPBS. The DoD does not have a single, autonomous FHP; each service has established different activities for operation and administration of FHP. Under the PPBS, DoD officials managing the FHP are involved in all phases through continuous cycles of funding request formulation, justification, and administration. It is during the planning phase of the PPBS that air capacity to overcome a threat is assessed and the FHP is considered for the first time (Ref. 6, p. 8-9).

The purpose of the FHP is to ensure overall air combat capability and specifically mission readiness of personnel and equipment involved in flight operations (Ref. 7, p. 7). It is the primary vehicle through which the services maintain a readily available air combat force, including aircraft, aircrews, ground support equipment and personnel, and fuel usage. When translated to budgeted hours, these factors are converted into a common denominator: dollars (Ref. 8, p. 7).

## **C. DEVELOPMENT OF NEEDS FOR SUBMISSION AND APPROVAL**

An essential objective of the program involves the training and maintaining of a proficient aviator corps. The FHP encompasses all flying activity, from training of new personnel to day-to-day flight operations. Although pilot proficiency is an integral measure of combat readiness, the functions to achieve activities combat ready status vary among the services (Ref. 9, p. 24). In general, new trainees receive basic training as pilots, and flight officers receive specialized instruction to develop skills on particular types of aircraft once they are assigned to a particular squadron (Ref. 10, p. 4).

The functions that a combat ready aviation squadron must perform also vary, depending upon the type, model, and series (T/M/S) of aircraft flown (Ref. 10, p. 5). Therefore, the ultimate objective of the FHP is to provide flying hours to major commands and their subordinate units in order to develop the functions and maintain a combat capable status.

### **1. The FHP in the Air Force**

The Air Force FHP is an aggregate of the programs developed by three major operating commands: Tactical Air Force (TAF), Strategic Air Command (SAC), and Military Airlift Command (MAC). MAC is somewhat unique, as its operations are financed through the Airlift Service Fund (Ref. 9, p. 25), which includes activities across various branches of service. In general, Air Force forecasting requirements are based on training, aircraft inventory, manpower, mission tasking maintenance, and general support. The requirements are developed from the bottom up in the Air Force operational organization, and are forecast over a six-year period by the Air Force Flying Hour programmers (USAFHQ/XOOTW) (Ref. 10, p. 6). Major Commands (MAJCOMS) generate their individual FHPs from the requirements submitted annually by each Air Force Squadron for the following two fiscal years.

Squadrons demands to MAJCOMs are determined considering the number of sorties required, sortie duration, and calculated aircrews. For a given level of readiness.

particular training programs specify the events necessary to obtain a desired proficiency. Each training event is multiplied by the average time required for completion. The resulting time estimates are added to find the number of hours required for each crewman. Furthermore, the number of hours required for each crewman are summed together along with the syllabus training hours and specific mission tasking to produce the command's overall flying hour requirement (Ref. 10, p. 15).

Aircrew requirements are calculated by establishing a crew-seat ratio for each aircraft and multiplying that by the number of aircraft. At the squadron level, sortie requirements are determined using Air Force Regulation 51-51 (AFR51-51), which establishes the number of sorties needed for proficiency in each aircraft type. The number of sorties required are found by multiplying the AFR51-51 requirements by the authorized flying billets for both line and staff officers.

A typical Average Sortie Duration (ASD) is developed by the MAJCOMs using training events and event duration. For instance, training events for a B-52 crew (such as low level bombing, low level navigation, or air refueling) would be assigned definite increments of time, which added together result in an ASD for that type of aircraft. This is illustrated by the following formula (Ref. 10, p. 15):

$$\text{HOURS} = (\text{AUTHORIZED AIRCRAFT} \times \text{SORTIES PER MONTH} \times \text{ASD}) \times 12$$

In this way, the total hours required to maintain aircrew proficiency result from the total sortie hours multiplied by the calculated aircrews.

Crew proficiency is based on models developed by the MAJCOMs relating to the Status of Resources and Training System (SORTS), a readiness reporting system established by the JCS. SORTS measures the status of a unit's resources and training. SORTS are classified as C-1, C-2, C-3, C-4, or C-5. Each category level represents the percentage of wartime required aircrews fully available and operational. Tactical Air Command (TAC) rates its crew potential using the Graduate Combat Capability (GCC) tables in TAC Manual 51-50.

The GCC system uses three capability levels based on the number of training sorties required for a pilot to achieve a given level of proficiency, as follows (Ref. 10, p. 17):

**Level A** sets the minimum number of sorties necessary for a aircrew to become sufficiently proficient to perform the unit's primary mission.

**Level B** sets the number of sorties required to increase aircrew proficiency, lower attrition, train aircrews in specialized tactics, and increase the unit's ability to perform its mission.

**Level C** sets the number of sorties required for a unit to complete training in all its assigned tasks and be fully mission capable.

If a unit's percentage of required aircrews is available and have completed all of a level's training requirements, the unit is considered to be rated under the corresponding category defined in SORTS.

Constraints on capabilities are determined by factors such as funding level, spares availability, depot backlog, crew availability, and manning degrees. When requirements exceed capability, it is necessary to make adjustments to increase capability or to reduce requirements by changing crew ratios, tasking or required level of readiness.

Each year the Air Force FHP is reviewed and updated based on projected force structure, funding, and mission tasking. Thus, the MAJCOMs submit their adjusted programs to the USAFHQ/XOOTW. Other adjustments to the program can be made during Financial Plan Briefings at the Air Force Financial Management Office (USAF/FM) (Ref. 10, p. 16-18).

POM submissions in the Air Force are reviewed by the Staff of the Air Force Secretary in a group led by the Comptroller, the Program Analysis and Evaluation Directorate, the Office of the Secretary of Defense (OSD), and the JCS. The review concentrates on the relationship of the proposed program to overall goals and current guidelines. Key issues in the POM are discussed by the DRPB and final decisions are conveyed through PDMs. Changes may be requested by submitting reclamas formally or in meetings with the SECDEF. If reclamas are approved, they are incorporated as an Amended Program Decision Memorandum (Ref. 11).

Once the PDM is definite, the Air Force Comptroller issues a budget call that provides guidance for formulating the Budget Estimated Submission (BES) document, which is developed at USAF/FM by updating the POM dollar appraisals with current cost information provided by the Air Force Cost Center (AFCC) (Ref. 10, p. 23).

The Air Force Comptroller reviews the FHP, ensuring that it conforms to legal requirements, has accurate cost estimates, and is executable. "Marks" (objections) issued by the Comptroller against the FHP are responded to by Airstaff through reclamas, if considered justifiable.

After approval by the Air Force Comptroller, the BES is submitted for review to OSD staff and the Office of Management and Budget (OMB) and "...the budget is verified for accuracy in cost estimates, feasibility, scheduling, and consistency with established priorities..." (Ref. 12, p. 350). After discussion of unresolved issues between the OSD and the OMB, the resulting decisions are incorporated in the budget through Program Budget Decisions (PBD). The incorporation of PBDs finalizes the President's budget that is presented to Congress in January.

Prior to the President's submission of the budget, each Executive Branch Department Secretary presents a more detailed report to Congress of his portion of the budget. The SECDEF presents an annual report to the House and Senate Armed Services and Budget Committees and Appropriations Subcommittees. Subsequently, the Secretary of the Air Force and the Chief of Staff of the Air Force present the Air Force Report to the same committees and subcommittees. An Air Force Issues Team provides study materials for the individuals who will serve as congressional witnesses. These documents represent the coordinated Air Force position on selected issues. The Air Force Program Evaluation Directorate prepares the FHP Fact Issue Papers and is routinely tasked with providing point papers on selected subjects and attending study sessions with senior Air Force members who are to testify before congressional committees.

As the House and Senate Armed Services and Appropriations Committees mark up the programs and budget, the flying hour programmers and the Air Force Cost Center (AFCC) are tasked with preparing Budget/Program Fact Papers concerning the FHP.

These documents provide additional program costing data, expand the Air Force explanation of an issue, or describe the impact of a proposed cut in the program that will be considered for final approval and emission of Budget Resolutions Authorizations, and Appropriations.

## **2. The FHP in the Army**

The Army FHP aggregates separate programs developed by the Army Major Commands. The Army Planning process identifies and quantifies hours for major command, combined arms, unit, and individual training needs for the aircraft systems assigned to major types of aviation units (Ref. 13, p. 2). The resulting flying hour models developed are based on aircraft type and are essentially oriented to provide training as indicated by the Aircrew Training Manual for each particular T/M/S (Ref. 13, p. 5). In this context, the Army FHP adds the training hours required for individual and those required for combined arms training, then it subtracts the training hours accomplished during combined arms and the training hours performed on simulators.

There is a specific number of individual training hours established for each aircraft system. Similarly, combined arms training is based on the type of aviation unit, the major command, and the geographic location the unit is assigned to. On the whole, the Aircrew Training Program states the following guidelines to compute the number of flight hours required for a given unit (Ref. 14, p. 5-1):

The FHP must be based on the minimum number of flying hours necessary to maintain individual, crew, and unit proficiency and those hours required to train supported units to ARTEP standards. To achieve the ideal balance of readiness at the lowest cost, the commander must consider the following:

- Crew member density.
- Annual crew member turnover.
- Number of aircraft assigned.
- Mission support requirements.
- Number of hours required for aircraft maintenance.

- Current status of aviation and supported unit training.

The factors to develop the needs of flying hours in the Army are identified in aviation training manuals and circulars. The commanders are directed to use them to compute the number of hours required to accomplish a task or training event. The following example (Ref. 15, p.13), illustrates the estimations carried out at the unit level for an AH-1 Attack Helicopter:

- AH-1 Aviators authorized/on hand: 52/40.
- AH-1 Aircraft authorized/on hand: 21/21.
- Annual Aviator turnover rate: 30 percent.
- Estimated number of newly assigned aviators to undergo qualification or refreshing training: 12 (30% of 40).
- Qualification training planning factor: 4 hours.
- Refresher training planning factor: 55 hours.
- Night vision goggle qualification training: 10 hours.
- Night vision goggle refresher training: 6 hours.
- Continuation training planning factor: 55 hours.
- Simulator time deducted from flying hour requirements per aviator: 12 hours.

A major objective is to integrate, to the degree possible, collective training into operational missions. At the same time, the commanders must also include 5 percent of the total estimated hours for maintenance activities.

Another aim of a unit's FHP in the Army is to consolidate unique mission support and operational requirements which fall into one or more of the following areas (Ref. 14, p. 5-2).

- Combat, combat support, and combat service support.
- Training and training support.
- Executive and staff transport.

- Support of assigned crew members, staff personnel or Reserve Component crew members.
- Research, development, test, and evaluation.
- Aerial photography and mapping.
- Aero-medical evacuation, crash rescue, or search and rescue.
- Intelligence and classified project.
- Attaches, missions, and Military Assistance Advisory Groups.
- Special missions unique to location or operation.

Some individual training events, for safety and standardization purposes, are accomplished only in an individual training environment. In other situations, the commander determines a percentage of individual training requirements that can be performed in conjunction with other events (Ref. 15, p. 1).

Cost data for the Army FHP is found in the Army's OP-20 report, which contains cost data for the operation of each aircraft in the inventory on a per hour basis. Once the program is completed for each type of aircraft assigned to the unit, the flying hour request is submitted to the next higher command responsible for allocation. From the previous example, the completed model is shown below:

- AH-1 aviators assigned: 40 aviators.
- Annual aviator turnover rate: 30 percent.
- Estimated number of newly assigned aviators to undergo refresher training: 12 (30% of 40).
- Qualification training: 4 hours x 6 aviators = 24 hours.
- Refresher training: 19 hours x 12 aviators = 228 hours.
- Mission training: 16 hours x 12 aviators = 192 hours.
- Continuation training (new aviators): 55 hours x 12 aviators x  $\frac{3}{4}$  = 495 hours (where  $\frac{3}{4}$  is the estimated portion of a training year remaining for newly assigned aviators).
- Continuation training: 55 hours x 28 aviators = 1540 hours.
- Night vision goggle qualification training: 10 hours x 3 aviators = 30 hours.

- Night vision goggle refresher training: 6 hours x 7 aviators = 42 hours.
- Total training hours required: 2,552 hours.
- Less simulation hours per aviator: -480 hours.
- Revised training hours required: 2,071 hours.
- Collective training hours (unit and combined arms): 1,800 hrs.
- Mission support hours: 100 hours.
- Training hours accomplished during mission support and collective training (50% of 2,071) = 1,036 hours.

This yields:

$$2,071 \text{ HOURS} + 1,800 \text{ HOURS} + 100 \text{ HOURS} - 1,036 \text{ HOURS} = 2,935 \text{ HOURS.}$$

Maintenance support hours (5% of Total Hours):

$$2,935 \times 0.05 = 147 \text{ HOURS.}$$

These computations result in an annual total flying hour requirement of  $2,935 + 147 = 3,082$  flying hours required for the unit considered.

The above requirements are evaluated by the MAJCOM Aviation Officer based on his or her judgment and historical data for each type of unit. Any significant deviations are marked, and adjustments are made accordingly. Eventually, MAJCOMs consolidate the requirements for all their subordinate units and submit the data for all aircraft systems to the Headquarters Department of the Army (HQDA) for resource allocation (Ref. 10, p. 39).

At the HQDA, management of the FHP is the responsibility of the Deputy Chief of Staff for Operations and Plans. At this level, the program is built on the assumption that for every aircraft in the inventory there is only one aircrew available to fly the aircraft. In this sense, the system is airframe based, in comparison to the early stages where subordinate units stated their requirements in terms of crews available and annual personnel turnover rates.

Because of the continuing work for the accuracy of the requests, the Army staff element responsible for the program recompile the data utilizing an Air OPTEMPO rate

as the basis for recomputations. ["Air OPTEMPO is defined as an indicator that expresses flying hour requirements, resources levels and execution... in terms of flight per-crew-per-month for rotary wing aircraft" (Ref. 12, p. 4)]. According to Cordrey's study, OPTEMPO represents the foundation for the Army FHP at the HQDA (Ref. 15, p. 25). For instance, to determine a particular aircraft systems requirement, the number of airframes are multiplied by the OPTEMPO rate and then by twelve to accommodate the annual aspect of the program. In reference to the example discussed above, the equations would be:

$$\begin{aligned} 21 \text{ AIRCRAFT (1 CREW PER AIRCRAFT)} \times 15.0 \text{ HOURS OPTEMPO RATE} \\ \times 12 \text{ MONTHS} = 3,780 \text{ HOURS.} \end{aligned}$$

This results in a difference of 698 hours when compared with the 3,082 hours calculated at the unit level. The combination of these two factors equate to a crew manning ratio of less than one.

The Army FHP budget is based on standard cost rates issued annually by the Army Comptroller. The standard direct cost rates represent the Army-wide average costs per hour for expenditures related to operation and maintenance for each aircraft (Ref. 13, p. 31). The total Army flying hours for each aircraft system are authorized each fiscal year by the Congress under the Army's total Operation and Maintenance budget. As a result, matching of programmed funds to actual costs occurs at HQDA, where operation and maintenance funds are set aside for the FHP.

### **3. The FHP in the Navy**

In the Navy, the FHP provides the planning and management of the annual flying hours for the Navy and the Marine Corps. Flying hours are allocated by the Navy for each T/M/S aircraft. The number of hours is based on force projections for the proposed fiscal year, the execution accomplished during the past three years, and predicted requirements for the upcoming year.

The planning process takes into account the required hours for each pilot in a particular T/M/S aircraft as set forth in the Commander-in-Chief Pacific and the

Commander-in-Chief Atlantic (COMNAVAIRPAC/COMNAVAIRLANT) 3500 series instructions which conforms to the training and readiness manual. This manual is approved by the Chief of Naval Operations (CNO), it is a joint training plan that identifies specific training events and establishes when a pilot must complete each event (Ref. 16).

The plan defines the number of flight hours required to complete each event, annual aircrew flying requirements, and required training resources. The events in the 3500 series instruction are given a numerical value related to their importance to the Primary Mission Area (PMA). As aviators perform more events, they become more qualified, and receive more points in a particular mission area. The maximum potential score for each mission area is 100 points. Pilots are considered combat ready when they achieve at least 75 points in each PMA (Ref. 10, p. 52).

Squadrons issue requests through the submission of flying hours required to maintain full mission readiness. Three major documents guide this task: 1.) Status of Resources and Training System (SORTS) Manual [NWP 10-1-11]; 2.) Required Operational Capability/Projected Operational Environment (ROC/POE); and 3.) Training and Readiness Matrices. The SORTS Manual covers submission requirements for the primary unit level readiness report. The SORTS report defines specific mission area proficiency requirements necessary to achieve the various combat readiness ratings ("C") which are subsequently reported to the JCS. In short, SORTS provides planners with a comparison between resources in an operational command and those required to undertake a unit's full wartime mission. The ROC/POE directive outlines broad combat capabilities and mission area for each T/M/S of naval aircraft. It categorizes mission tasking into PMAs and delineates broad combat capabilities expected during wartime operations. Finally, the Training and Readiness Matrices describe guidance about competency levels necessary to justify a particular "C" rating in accordance with the SORTS Manual (Ref. 7, p. 10-11).

Applying the information from the three sources mentioned above, squadrons are able to compute the number of flying hours required to achieve 100 percent combat

readiness in all assigned mission areas. This figure is associated with anticipated costs of assigned aircraft maintenance costs, miscellaneous supplies and administrative travel necessary to support the unit's FHP that will be submitted as the annual budget request for each particular unit.

The flying hour and budget requirements for aviation squadrons are currently concentrated in the Primary Mission Readiness (PMR) concept. This concept is central to the calculation for the FHP budget. While the Navy's flying hour commitments do not decrease in terms of actual needs, an internal constraint has been imposed, establishing a PMR percentage of 86 percent as the CNOs flying hour goal. The PMR percentage is the Department of the Navy (DoN) peace time goal for the overall program with respect to full requirements (Ref. 10, p. 9-10). It is relevant to mention that funding levels vary depending on the DoN readiness goals and a unit's operational status. For instance, deployed squadrons are funded above 100 percent of PMR (Ref. 17, p. 15).

The following example from a study conducted by Edward J. Martin Jr. (Ref. 6, p. 21) illuminates the determination of flying hour requirements based on the projected number of crews assigned to a squadron. The projected number of crews is found by multiplying the average number of Primary Authorized Aircraft (PAA) assigned to a squadron by the Crew Seat Ratio (CSR) which is the number of aircrews programmed per operating aircraft in fleet operating squadrons. The resulting projected number of crews are multiplied by the Aircrew Manning Factor (AMF) and by the required hours per crew per month (H/C/M) to give a monthly flying hour requirement. This result is then multiplied by 12 to yield the annual flying hour requirement, which, multiplied by a particular PMR, gives the annual budgeted flying hours. Finally, this figure is multiplied by the Cost per Flight Hour (CFH) to determine the annual budgeted costs. This computations are represented more clearly in the following hypothetical equations:

$$\text{PAA} \times \text{CSR} = \text{ALLOWED CREWS} \times \text{AMF} = \text{BUDGETED CREWS}$$

$$12 \times 1.17 = 14.04 \times 1.0 = 14.04 \text{ crews}$$

$$\text{BUDGETED CREWS} \times \text{REQ H/C/M} \times 12 \text{ MONTHS} = \text{ANNUAL FH REQ}$$

$$14.04 \times 25 \times 12 = 4,212 \text{ hours}$$

ANNUAL FH REQ x NO. OF SQUADRONS = TOTAL ANNUAL FH REQ

4,212 x 22 = 92,664 hours

TOTAL ANNUAL FH REQ x PMR = ANNUAL BUDGETED FH

9,2664 x .85 = 78,764 hours

ANNUAL BUDGET FH x CFH = ANNUAL BUDGETED COST

78,764 x \$2,993.75 = \$ 235.8 million

The CSR is established for each aircraft by the DoN (Personnel). The aircrew manning level is determined by the CNO, based on manning levels and adjusted by the Special Assistant for the FHP (OP-05E), taking into account fluctuations in recruitment, retention rates, training command output, and losses due to illness or accident (Ref. 18, p. 15).

The required hours per crew per month is established by a joint Type Commander instruction which determines the minimum number of hours per month and the types of missions that a pilot must fly to become and stay mission ready. The PMR is influenced by a three year average on percent of execution, and is intended to smooth the fluctuations between flying hour requirements from year to year. The CFH is deduced from averages in petroleum, oil, and lubricants (POL) consumption rates, aviation depot level repairables (AVLDR's), and maintenance costs, with an adjustment for inflation as mandated yearly by the Navy Comptroller in NAVCOMPT Notice 7111 (Ref. 10, p. 56). When applicable, there is a small percentage of reduction in dollars that results from achieving some of the pilot proficiency requirements in simulators.

The entire package of information on cost per hour and required hours is documented in the Operations Plan 20 (OP-20) Report. The OP-20 establishes controls on fleet planning (Ref. 9, p. 35). OP-05, the FHP coordinator under the Deputy CNOs for Air Warfare, takes the OP-20 Report and checks the flying hour requests with other fleet proposals and Defense Guidance (Ref. 19, p. 9). The OP-20 is incorporated into the budget proposal and submitted to the Navy Comptroller to make sure it is in agreement

with NAVCOMPT Notice 7111, CNO directives, and Defense Guidance, as will be discussed later.

#### **D. FLYING HOUR PROGRAM COSTS**

The Cost per Flight Hour (CFH) reflects the fuel and maintenance costs of operating an aircraft, including the costs of parts repair and replacement. To determine the budget for the FHP in the Navy, the cost per hour figure is computed by combining the elements required to fly a particular T/M/S.

Cost data for T/M/S aircraft is collected into four integral cost pools, which are mutually exclusive, collecting all costs associated with operating and maintaining the aircraft with the exception of personnel. These costs are (Ref. 20, p. 17):

POL: (Petroleum, Oil and Lubricants). The cost of aviation fuel, engine oil, and lubricants.

OMA: (Organization Maintenance Activity). The costs incurred at the squadron level to maintain the aircraft. OMA costs are entirely for consumable, or items that are more economical to replace than repair.

IMA: (Intermediate Maintenance Activity). The costs associated with intermediate level repair and maintenance. These are costs related to both consumable and repairable items; those for which repair is considered more economical than replacement.

AVDLR: (Aviation Depot Level Repairable). The costs of major component rework, repair and replacement beyond the Aircraft Intermediate Maintenance Department (AIMD) level of capability. For most aircraft T/M/S, AVDLR represents the largest and more variable cost pool.

Organizational maintenance (OMA) is concerned with daily aircraft repair activities at the squadron level. It includes:

- Scheduled aircraft maintenance (repairs based on calendar time or hourly operation);
- Unscheduled aircraft maintenance (repairs of aircraft malfunctions noted during scheduled inspections or as a result of post-flight objections);

- Supply support (the stocking, collection, distribution, and requisitioning of consumable or repairable aircraft components and administrative supplies);
- Documentation (departmental and aircraft records, as well as input to utilization of the Maintenance Data Collection System (MDCA)).

Costs of unscheduled maintenance are derived from T/M/S historical averages when constructing budgetary inputs (Ref. 7, p. 60).

The mission and scope of services provided by an AIMD is dictated by the number and T/M/S of aircraft supported by tenant commands. The extent and overall capability of these services is limited by the allocated funding level where the facility is located. AIMDs are usually located on Naval Air Stations or air capable ships and they are organized by area of expertise. For example, a Naval Air Station would have an AIMD for engines, electronics, hydraulics, and other appropriate systems. This centralization of maintenance functions allows AIMDs to use specialized skills, equipment, and parts more efficiently than if they were distributed to every squadron. When a squadron turns in a part for repair, technicians check stock inventory to see if a replacement part (spare) can be issued. If not available, the part is designated as an "Expeditious Repair" and inducted for rapid handling and return. When the part is considered "Beyond the Capability of local Maintenance" (BCM) it is forwarded to a cognizant Aviation Depot or better equipped IMA facility. The Aviation Supply System does use a predictive formula to forecast expected demand rates and component repair items due to BCM action (Ref. 7, p. 61-64).

Aviation Depot Level Repair (AVLDR) obligations are heavily affected by unexpected BCM actions from the intermediate level. AVLDRs' are expensive, and usually require a long procurement lead time, as the repair of defective units is the primary source of system replenishment (Ref. 21, p. 30). Depot level maintenance is where complex and timely overhaul work is accomplished. These maintenance functions are centralized through the United States at sites called Naval Aviation Depots (NADEP). When a part requires depot level maintenance, the AIMD ships it to the appropriate NADEP for repair or replacement. If depot level maintenance is required on a large assembly of the aircraft, it sometimes becomes more efficient to send a team of NADEP

technicians to the location of the aircraft to complete the required maintenance. A good part is returned to the AIMD inventory, allowing for greater availability of replacement parts in the supply system. The funds for this maintenance still come from the ship or station that was allocated funds to support that aircraft in question. Other activities on aircraft performed at the NADEP locations consist of periodic inspections that cover every system of the aircraft and usually include stripping and repainting. These routine functions are not charged to Aircraft Operations Maintenance funds and are not considered in the management of the FHP (Ref. 18, p. 32).

AVLDRs are centrally managed by the Aviation Supply Office as part of the Navy Stock Fund (NSF) or as end-use inventories held by aviation support activities. The NSF is a revolving fund with two primary assets: cash and material. The cash is used to build up or maintain material inventory through payment for repair of material and purchases of new items from vendors. When material is issued to a customer, the NSF is reimbursed from the customer's operating funds. The cash is then used to replenish the NSF material inventory. Under NSF financing, users reimburse the stock fund for AVLDRs with their operational funds, usually the user's share of the annual Operation and Maintenance (O&M) appropriation.

The FHP, funded by the O&M appropriation, includes costs for the factors in the cost pools referenced above. Costs not covered by the flying hour program include procurement, overhaul, and repair of complete aircraft and engines. The payroll for aircrew and maintenance personnel, maintenance training, and the costs of aviation facilities themselves are also paid for by other programs (Ref. 21, p. 40).

The comptroller's office tracks flight hour and cost data provided by the squadrons. Therefore, a total cost for operating and maintaining each squadron's T/M/S aircraft is derived from the accumulated cost data in the four cost pools already mentioned. The total is divided by the flight hour for the period to achieve a cost per flight hour, as depicted in the following equation (Ref. 20, p. 17):

$$\frac{\text{POL} + \text{OMA} + \text{IMA} + \text{AVLDR}}{\text{Flight Hours}} = \text{COST PER FLYING HOUR (CFH)}$$

Cost of POL is averaged over the previous 24 months and adjusted for any changes in price. In the same way, the cost of AVLDR's is averaged over the previous 18 months and adjusted for budgeted inflation. Finally, maintenance costs are averaged over the previous 36 months and adjusted for inflation. The inflation figure is published yearly by the Navy Comptroller in NAVCOMPT Notice 7111. If a new type of aircraft is entering the inventory, then these costs are estimated by using costs for an aircraft with a similar mission, capability or function (Ref. 18, p.14). At this time, reduction is applied for pilot proficiency requirements achieved in simulators (Ref. 10, p. 56). Air support budget development is based not only on historical CFH but also on historical utilization rates. Though other factors, such as aircraft inventory, are considered the major factors in calculating the funds are previous execution costs (Ref. 18, p. 17).

In financial terms, there are two sources of funding, called Operating Target Functional Categories (OFCs), that provide support to the FHP. The first is OFC-01, or Primary Aircraft Flight Operations (AFO), which includes POL as well as other support and maintenance material (flight equipment, administrative supplies, etc.). The second is OFC-50, or Primary Aircraft Operations Maintenance (AOM), which includes both OMA and IMA and relates to Aviation Fleet Maintenance (AFM), consumables, repairables, and AVDLR's (Ref. 10, p. 51). This category also includes AOM performed while a unit is deployed from its home station. AOM costs are predominantly incurred by aviation related shore facilities.

Since a majority of AFO funds finance the fuel requirements of aviation forces, there is a closer correlation between these costs and flight hours than with the AOM portion of the FHP (Ref. 7, p. 48). This fact validates the use of CFH for predicting future AFO needs within the process. AOM costs are less accurate, as they include other variables not directly related with the number of hours flown, such as environment, age of aircraft, and training of maintenance personnel.

Totals for each of these categories of costs are submitted to the Type Commanders (TYCOM's) in the form of Flight Hour Cost Reports (FHCR's) for shore stations and Budget Operating Reports (BOR's) for fleet squadrons. These reports

constitute the key financial management device in the Flying Hour Program (Ref. 10, p. 53). They are utilized by TYCOM's to (1) evaluate the unit's financial status, (2) support subsequent budget decisions and submissions, (3) measure budget performance (4) and prepare FHP management control reports (Ref. 7, p. 30).

FHCRs are prepared by the type commanders and sent to the Navy's FHP on a monthly basis indicating all obligations incurred in the applicable funding codes. They are the primary source for AVLDR and IMA costing information. Likewise, BORs are submitted each month with information about POL consumed, obligation totals for aircraft operations, and organizational level maintenance for the period. In the same manner, BORs include number of operating aircraft assigned and total flight hours flown by each T/M/S, for the month and cumulative for the fiscal year.

The CNO's method for recording historical costs of the FHP and projecting future costs is Operations Plan 20 (OP-20). There are several types of OP-20 reports published. Some are published on a monthly basis as FHP operating expenses are incurred. Another report, the History Final, summarizes the total costs for program execution in the previous year and comes out in late January of the current year (Ref. 22, p. 12). The historical OP-20 reports help program managers at all levels keep track of performance in program execution.

Another category of OP-20 is used for including the FHP requirements into the executive budget. There are three versions: the first is called the POM OP-20 when generated by the Program Office for initial approval; when approved by CNO, NAVCOMPT, and OSD the report is referred to as the NAVCOMPT Final; the last version is called the Congressional Final, and it actually allocates funds to the FHP. Adjustments are made along the way, requiring; Program Managers at the execution level to decide on how to use limited funds for flight operations without affecting safety, readiness, and mission accomplishment (Ref. 18, p. 12-13).

A third category of OP-20 concerns the four years after the coming budget year, and constitutes a projection of mission needs and predicted costs to support future flight

operations. For this reason they are called Planning OP-20s, and are used to complete the planning requirements in the FYDP.

### **III. MANAGEMENT OF THE US NAVY FHP**

The previous chapter addressed the FHP as it is found in the air components of the branches of the US military. This chapter will focus on the FHP in the US Navy. This level of inquiry will allow for the identification of key players in the FHP process, which is the focus of Section A, below. Effective implementation of the Navy FHP provides key management tools for the planning and execution phases of the budgeting process itself, as discussed in the second two sections of this chapter. The data intensive nature of the FHP requires the development of information systems for the accurate collection and timely dissemination of critical information. Information systems implementation in the Navy FHP is the subject of the fourth section of the chapter. Another crucial element of the Navy FHP is explored in the final section of the chapter, which discusses the effort to measure performance and variation.

#### **A. KEY PLAYERS**

Two people play significant roles in the FHP budgeting process in the Navy: the Special Assistant for the FHP (OP-05E), working for the Assistant Chief of Naval Operations for Air Warfare, and, the Flying Hour Program Budget Analyst (OP-821D2), who works for the NAVCOMPT (Ref. 6, p. 15).

The Special Assistant for the FHP is responsible for the overall management of the program -- budgeting, coordination and monitoring. He or she is charged with justifying the operational and flight training activity required to meet the CNO's stated primary (PMR) goals. The OP-05E is also responsible for the projection of future program requirements, monitoring program execution, publishing baseline reports, and coordinating with NAVCOMPT to ensure that budget actions required to meet PMR goals are accomplished. Perhaps the most critical role of OP-05E is in maintaining open lines of communication with the Fleet Commanders and Air Type Commanders to ensure continued viability of the program. Finally, the Special Assistant is responsible for controlling, directing, and funding the automatic data processing hardware and software necessary to develop the program requirements, budgets, and reports.

The NAVCOMPT Flying Hour Program Budget Analyst (OP-82) works very closely with the OP-5E. The budget analyst's main function is to ensure that the budget is properly priced and executable, and passes a satisfactory FHP budget up the chain of command to the OSD (Ref. 6, p. 15-18). Particularly, the reviews ensure that budget estimates: (1) are in agreement with the POM, SECDEF guidance, and available decision documents; (2) contain valid and current costs and pricing; (3) are well justified and consistent; (4) maintain financial stability and balance; (5) are executable; and (6) conform to legal requirements (Ref. 7, p. 21).

Other entities playing an important role in the FHP budgeting process are the Air Type Commanders, the Deputy CNO for Navy Program Planning, and the Aviation and Manpower Training Division. At the unit level, Air Wing Commanders and Squadron CO's must ensure that dollars spent do not exceed the allocation. They must also submit established reports to ensure that proper execution is being accomplished and acknowledged in the chain of command. Success of the FHP relies on coordination, communication, and cooperation between the many people working toward the same goals at every level of the process.

## **B. MANAGING THE BUDGETARY PROCESS**

Based on the Defense Guidance initiative put forward by the Secretary of Defense and the DRPB, NAVCOMPT distributes an annual "Budget Call" in the form of a notice (NAVCOMPT 7111) to all budget submitting activities. It contains instructions and guidance for the content of budget estimates, submission schedules, and rates to use for inflation, among other data.

Following the instructions in the budget call, each unit authorized a Budget Operating Target (OPTAR) (in the case of squadrons), or an Operating Budget (OB) (in the case of stations), submits its funding request for the next budget cycle through its administrative chain of command. The requests are combined into a POM by the major claimants (Specified Fleet Commanders) and submitted to NAVCOMPT. Although the POM covers a six year period, only the first two years are utilized in the budget

eventually submitted to Congress. During development of the POM, claimants have the opportunity to provide formal input. If one of them does not agree with the POM, they can submit issue papers to OP-05 indicating the priority of the issue and the offsets from lower priority programs associated with their recommendations. After all appraisals have been completed and command input has been given consideration, OP-05 submits its proposed program changes to NAVCOMPT. The program is then evaluated for compliance and justification according to regulations and official criteria.

When NAVCOMPT finds an area either unjustified or indefensible before Congress they propose a compensation reduction, or *mark*. In that case, the submitting activity chain of command must justify the original submission through a reclama to maintain the particular line item in the budget.

Once NAVCOMPT is satisfied with executability of budget submissions, the FHP is incorporated into the DON Budget and submitted to the comptroller for the OSD. It is then combined with the FHPs of the other services and reviewed by the Assistant Secretary for Training and Readiness, the DoD Comptroller, and the DPRB. The Office of Management and Budget (OMB), together with OSD, also reviews on the Budget. When these two entities assent on the funding request, OSD issues the Program Budget Decisions (PBDs) which become the DoD component of the upcoming Federal Budget submission to Congress (Ref. 7, p. 22).

### **C. MANAGING THE EXECUTION OF THE FHP**

Once the Congress has passed the defense Authorization and Appropriation Acts, and they have been signed by the President, the Acts must be implemented. Appropriation for the FHP is mainly covered under the O&M major title. Nonetheless, DoD manages the defense budget in a format different from that used by Congress. The DoD budget is structured in eleven "program elements" which cover manpower, support equipment, and weapons. For instance, "F/A 18 squadrons" constitutes a program element, which is defined as follows (Ref. 4, p. 18):

0204136N F/A-18 Squadrons; X-4-03; Includes manpower authorizations, peculiar and support equipment, necessary facilities

and the associated costs specifically identified and measurable to the following: Strike Fighter Squadrons. Planned follow-on for A-7 and F-4 Squadrons. Proposed missions are closed tactical air support, deep strike, and interdiction missions, air superiority, fleet air defense, air-to-ground weapons delivery and strike escort. Excludes Aircraft Readiness Squadrons.

The Treasury Department authorizes draws upon funds from the accounts established through an appropriation warrant. The appropriation warrant cites the amount approved and identifies restrictions imposed by the Congress. Later, the warrant is forwarded to the General Accounting Office (GAO) for counter signature. This step makes appropriated funds available for apportionment and allocation under which obligations may be incurred and expenditures made.

Appropriated funds flow from OMB to the OSD comptroller for budget execution through an apportionment process. OSD then apportions the funds to the military departments. Next, apportioned funds are internally distributed through an allocation process. Following this, the O&M fund is broken down into OFC-01 and OFC-50 funds for the FHP in the Navy. The Navy Comptroller reallocates these funds to the major claimants, who in turn issue allocations in their respective chain of command.

Each squadron is issued an OPTAR by its Type Commander, providing an estimate of the amount of money that the squadron requires to perform its mission. OPTAR are distributed by the squadrons on a quarterly basis. Three times a month the OPTAR, both for OFC-01 and OFC-50, funds are totaled, verified, and reported to the Fleet Accounting and Disbursing Centers Atlantic and Pacific (FAADCLANT/PAC). At the end of every month, each command submits a Budget Operating Report (BOR) to the respective FAADC, who in turn consolidates all BORs and submits a report to the Controllershship for monitoring purposes (Ref. 10, p. 63).

The BOR is the primary financial management device used for administering the FHP. BORs are the basis for official accounting records that form the inputs to the CNO Flying Hour Cost Report. Moreover, BORs support obligational accounting while requisition processing keeps tracks of actual expenditures. In addition to this, operational Commanders use the BOR as the primary tracking mechanism for FHP execution. Its

accuracy and timeliness is of extreme importance, since future decisions are contingent on past execution (Ref. 18, p. 28).

At the end of every quarter any unobligated funds are passed back up the chain of command for reprogramming. This mechanism provides flexibility to the Airwing Commander and the Type Commander levels to reprogram assigned funds within their subordinated commands. However, there is a limit to transfer funds per Budget Activity per fiscal year. To monitor the execution, to reprogram, and to expedite proper use of allocated funds, the Navy's FHP is managed and tracked by a highly automated system.

The inputs and reports processed by the automated system are considered timely and accurate (Ref. 10, p. 64). Budget estimates for flight operations are based on procedures that quantify hours and funds; current management controls supported by the system insure that hours flown and dollars spent do not exceed those allocated.

#### **D. MANAGEMENT INFORMATION SYSTEMS**

The Headquarters Expense Limitation Management System (HELMS) is the database for the FHP. When FHCR and BORs are received, the comptroller's staff input the data. These squadron and air station inputs are processed as described below in a study conducted by Michael Edwards (Ref. 7, p. 32):

...inputs are combined with data from Summary Filled Order Expenditures Differences Listing (SOFDL) and the Material Turned Into Stores (MTIS) and differences tape received from their respective Fleet Accounting and Disbursing Centers (FAADCPAC/FAADCLANT). A "Distribution" program is run which collects information and totals on obligations/expenditures for each activity and for each TEC [Type Equipment Code], the data is separated into "Record Types" (i.e., fuel, maintenance and repair, AVLDR, etc.) for logical groupings and spending-type subtotals. These resultant figures are then manipulated through the FHCAS [Flight Hour Cost Analysis System] program with the output printed into a variety of local ("in-house") and externally-disseminated reports.

The information collected, processed and distributed through this system allows the recording, tracking, and prediction of FHP variables at the levels where managerial

decisions concerning financial and budgetary issues must be made. Some of the reports that support these decisions, as indicated by Edwards, are:

**Operational Report 32 (OP-32)** - A Budget document, separated into appending categories by Appropriation, Budget Activity, Activity Group, and Sub-Activity Group (i.e. past and future obligations for TACAIR fuel).

**Operational Report 5 (OP-5)** - Serves as an indicator of FHP status to the Major Claimant. Delineates increases/decreases in flight hours and corresponding dollars to various programs, costs of squadron transitions, standups, and standdowns, and projected FHP expenditures for POM inputs.

**Tracking Report** - An informal local report delineating FYTD obligations in cost pools affecting CFH computation: flight hours, fuel, maintenance and repair, and AVLDR. Covers all information listed on the format FHCR (below) plus it includes comparison data between TYCOM calculations and NAVCOMPT guidance for acceptable CFH limits by TEC.

**Flight Hour Cost Report (FHCR)** - The primary TYCOM FHP status report; their official and direct input to OPNAV/NAVCOMPT...At CNAP, FHCR refers only to inputs, whereas the generated output is known as the "T/M/S Report". For CNADEP, FHCR covers it all.

The "in-house" Tracking Reports have been identified as one of the most valuable tools for management of the FHP. They are easily accessible in simplified format for the administrative offices at the headquarters and other sites where information is manipulated. They produce Fiscal Year To Date (FYTD) totals for each area of expense accumulation affecting cost per flight hour that allows for the comparison of projected and actual cost figures comprising the FHP.

For each specific line item, these reports provide the cumulative total flight hours flown, fuel consumed, and the computed CFH for each of the primary cost pools. Other data refers to the number of operational aircraft per TEC, expenditures for civilian maintenance contracts, and total obligations incurred (Ref. 7, p. 34-36).

In managing data cost related to maintenance operations, the action required and material used are registered on maintenance action forms in the automated information system designed for collection and management of this information. The record is

entered directly by the squadron maintenance departments. When parts require AIMD action, they are delivered with a copy of the Maintenance Action Form (MAF) to the nearest location for repair or replacement. In that case, the accounting activity receives a report from the AIMD indicating the amount of I-level performed; otherwise, a standard charge for replacement and shipment to a Designated Overhaul Point (DOP) is noted (Ref. 18, p. 36).

The Aviation Supply Office (ASO) charges user activities for AVDLRs. The price charged is dependent on whether or not the activity returns an unserviceable component (carcass) in exchange for each NSF AVDLR issue. When a carcass is returned, net price is charged for an AVDLR. A "standard price", usually higher than the net price, is the cost submitted to an activity if no carcass is returned (Ref. 21, p.1).

Information concerning maintenance expenditures is fed into CNAP's Flying Hour Cost Analysis System and compared with official records at FAADCPAC/ATL on AOM obligations for validation prior to submittal to OPNAV for use in budget formulation.

To reduce the possibility of errors generated by data entry, incorrect data, and late entries that would invalidate the precision of OMA and IMA costing data, the Navy introduced two initiatives: the Personal Computer Message Transmission (PCMT) and the Aviation Storekeeper Information Kit (ASKIT). The PCMT expedites FHCAS data entry and eliminates possible data transcription errors, utilizing floppy disks to send monthly information about squadron BORs and station FHCRs to the Type Commanders. ASKIT organizes and automates the unit's OPTAR log utilizing a spreadsheet at the squadron supply-management level; this initiative is intended to allow FHP managers to run totals of squadron financial obligations in a real-time, more efficient environment (Ref. 7, p. 49-50).

In addition to these systems, another three initiatives have been undertaken by the Navy to ensure accurate collection and dissemination of information concerning the FHP: (1) the Computer-Aided NAVFLIRS Data Entry (CANDE) system; (2) the Training and Readiness Matrix System (TRIX); and (3) the Naval Aviation Logistics Command Maintenance Information System (NALCOMIS). CANDE and TRIX aim to improve the

accuracy of the Naval Flight Record Subsystem (NAVFLIRS) and to link requirements determination and resource expenditures to program achievement (Ref. 6, p. 33). NALCOMIS is designed to improve management of maintenance related documentation in the FHP process.

CANDE is a computer system developed by the Naval Sea Logistics Center which allows direct entry of naval aircraft flight record data into an automated data base. This data base is integrated to the CNO's Flying Hour Projection System (FHPS), the Aviation Maintenance and Material Management System (3M), the Flight Hour Cost Reporting System (FHCRS), the Maintenance Data Collection System (MDCS), and the Training and Readiness Matrix System. Before CANDE was developed, the NAVFLIRS was a form-intensive system with complex and intricate procedures, highly susceptible to errors and unable to give readily available data. The NAVFLIRS system has many uses, including budgeting and funding decisions, maintenance and logistic support, and safety analysis. Edwards points out the following goals pursued with CANDE (Ref. 7, p. 69):

- Provide accurate data for "up-line" processing.
- Give 100 percent validation at point of data entry.
- Facilitate completion of "Yellow Sheet" (NAVFLIRS) information.
- Reduce Operation/Maintenance Department processing time.
- Provide an OPNAV 3710/4 (NAVFLIRS) facsimile.
- Have local report generation capability.

The system allows aviators or other designated personnel to enter flight data into a squadron computer programmed with edit checks. Before CANDE was operational, aircrews would fill out a "Yellow sheet" in Maintenance Control, registering aircraft identification, flight time, mission codes, intermediate stops, and ordnance expended information. These forms were routed to both the Operations and Maintenance Departments for gathering and registering of data. With the new system, flight information is entered into a computer by the aircrew, through user oriented and reliable procedures. The data base supporting the system provides direct access to information

about aircraft records, aircrew flight times, mission accomplishments, and squadron flight hour totals for CFH computation purposes (Ref. 7, p. 70).

The first CANDE prototype was installed at four "alpha" test sites in 1989, and it has been improved over time. The "beta" site testing started almost one year later, with over eighty participating locations. Since mid-1991, the system has been implemented Navy-wide. According to Edwards' research, the system has proved to be extremely positive, saving time and effort by improving flight hour accounting and reporting accuracy.

TRIX is a computer-based interactive system designed for automation of the mission readiness evaluation procedures defined in the Squadron Training and Readiness Matrices instruction; it was also developed to connect operational effectiveness and resources expended. The TYCOM training and readiness instructions establish the number of flight hours and specific training events required for pilots to become proficient in each primary mission area assigned to the various types of aircraft. The TRIX system uses the data entered through CANDE to ensure that aircrews are maintained at the highest level of readiness attainable. Martin Edward Jr. noted the following capabilities of the system:

- Provide "on line" entry level readiness capability.
- Upload flight training event codes extracted from Naval Aircraft Flight Record Data.
- Allow "on line" data entry of ground training codes.
- Compute qualification points and currency expiration dates for all assigned aircrews.
- Compute squadron readiness for each assigned Primary Mission Area (PMA).
- Provide on line status of aircrew and/or squadron readiness.
- Provide local reports.

In summary, TRIX provides completed training and readiness reports as well as individual follow up and appraisal of required qualifications; thus, it facilitates

manipulation and submission of SORTS messages to JCS for combat readiness status reporting. These complementary systems are implemented to expedite and to improve the management of the FHP at all levels. They enable easy entry and inquiry for updating and reviewing goal performance by all parties involved in the process.

Finally, the Naval Aviation Logistics Command Maintenance Information System (NALCOMIS) is a computer application conceived to improve the management of the maintenance documentation in the FHP. It covers each phase of maintenance from scheduled actions to unscheduled repairs, and from the initial requisition of parts at the originating unit to replacement of parts by the supply system, or repairs at intermediate or level facilities.

This system also has the ability to interface with the Uniform Automated Data Processing System (UADPS), which is utilized for the processing of requisitions for consumables. NALCOMIS has replaced the previous Visual Information Display System/Maintenance Action Form (VIDS/MAF) in three maintenance related phases (Ref. 18, p. 73): Phase I deals with Navy repairable maintenance management at all sites; Phase II is oriented toward repairable asset management at the Intermediate (IMA) and Depot (AVDLR) level, as well as the base Supply Support Center (SSC); and Phase III refers to the individual squadrons/aviation support units (OMA) component repair and replacement.

During the entire process, NALCOMIS tracks the location and status of the parts. The status is available to anyone on the network. The system also allows verification of supply stock prior to submitting a requisition, as well as the probability for obtaining and to get acquainted about a part outside the system. Another feature is that all requisitions are screened against the data base to detect errors and assist in their correction, preventing delays and possible double charges while reordering a part. The maintenance controllers may call up a summary of all maintenance actions, supply requisitions, or aircraft status at any time.

Implementation of the NALCOMIS system includes mainframe computer systems, communications/network capability, specialized terminals, specifically

developed software, and the creation of on site data bases. The system has been active since 1992 with the support of special teams who are prepared to facilitate the transition from the previous system in an orderly and effective way. Nonetheless, reported apprehension about implementation has required special attention for successful and effective utilization of automated systems (Ref. 7, p. 29).

## **E. MEASUREMENT OF PERFORMANCE AND VARIATIONS**

The final outcome of the FHP is measured in the air military capability that forces acquire after spending the funds allocated. According to DoD, a unit is considered to be fully combat ready when "it is capable of performing the wartime mission for which it is organized or designed" (Ref. 23, p. 7). At the same time, capability is identified as a combination of readiness, force structure, sustainability, and modernization. In 1986, the Joint Chiefs of Staff established the Status of Resources and Training System (SORTS) to measure readiness in four areas -- personnel, equipment and supplies on hand, equipment condition, and training; this system focuses on the status of a unit's resources and training measured against those required to undertake its wartime mission (Ref. 24, p. 5). The FHP incorporates these principles for evaluation of overall program achievement. The main determinants of combat readiness within the FHP are availability of operable aircraft and proficient aircrews. Evaluations conducted by the GAO have recognized the ability of DoD to control limits on funds and flying hours, but the agency has formulated objections on the budgeting and execution processes followed within the FHP.

In 1976, the GAO requested improvement of the accuracy of reports on aircrew readiness with the end goal of eliminating unnecessary flying and increasing the benefits from hours flown. In 1979 it suggested reducing the standards for tactical and air patrol aircraft and emphasizing consideration of material readiness and maintenance plans when developing the needs for the FHP. In 1983, the GAO reported that budget estimates for the FHP were being based on training requirements alone, without accounting for other missions being funded. Lastly, the most relevant concern presented by the agency refers

to the absence of "program goals and performance indicators to measure program effectiveness and to develop future budget requests" (Ref. 25, p. 9).

Studies conducted by the GAO have focused on operations related to tactical and strategic level commands of the Air Force and the Navy, since it is estimated that most of the FHP requirements are directed toward this portion of the General Forces FHP budget (Ref. 25, p. 2). Guidance to manage the program, as well as the qualifications of the personnel managing it, are well accepted; certainly, the program manager is recognized to have an understanding of the PPBS process and knowledge of historical records required for proper administration of the FHP.

Controls established to monitor hours flown and to ensure that obligations incurred do not exceed resources allocated have been out of the question. Managers at several levels have flexibility, during the execution process, in deciding where to place the resources by moving O&M funds between the various type of aircraft and among other categories of the general purposes budget activity (Ref. 25, p. 15). This flexibility allows them to react to operating conditions such as lack of spare parts to increase the availability of aircraft. On the other hand, the methodology applied to develop the needs in relation to expected outcomes, primarily on aircrew readiness and proficiency, is still a matter of concern.

Both DoD and the GAO have agreed that the values used in determining requirements need to be validated (Ref. 25, p. 43). The budget estimates for aircraft operations result from the application of formulas to calculate the hours and funds that satisfy the operating tempo expected to achieve. According to the GAO, the hours flown and costs incurred generally correlate, but the formulas are "based on standards supported by expert judgment that have not yet been validated in other ways". The criteria to determine whether an aircrew is combat ready are established at the discretion of experienced pilots, without considering a definite relationship between the number of sorties or hours flown and the proficiency achieved from them.

DoD has initiated several efforts to develop measures of program achievement and indicators that quantify the relationship between program performance and different

levels of funding. This endeavor would be supported with objective data linking the amount and frequency of flying hours to mission readiness and aircrew proficiency attained for each type of aircraft. Among the measures suggested to quantify impact on performance, the most relevant are bombing and landing scores, flight check grades and mishap rates. In addition to providing a better way of justifying the budget, this data is intended to explain variances between program goals and actual results. Further, decision makers would be able to anticipate the impact of shortfalls in training and air combat capability.

In 1987, the Institute for Defense Analysis (IDA) was instructed by DoD to carry out a study entitled "Improved Methodologies for Relating Flying Hour Activity to Operational Readiness and Safety Measures" to validate flying hour requirements in terms of proficiency and safety of aircrews and to provide managers of the FHP with better justification for funding of the program (Ref. 23, p. 11). Phase I of the study determined the feasibility of building relationships between capability and resources using information on the performance of aircrew personnel. Phase II analyzed several missions to produce illustrative relationships between flying hours and performance. The FHP would be oriented to ensure short-run qualification standards and accumulated experience obtained by pilots. Phase III will formulate a system to carry out the recommendations derived when analysis on quantitative data collected from representative aircraft in the services is complete (about three years from now).



#### **IV. BUDGETING IN THE COLOMBIAN AIR FORCE**

This chapter is intended to acquaint the reader with general information on the CAF budgeting process, as well as the general budget environment within which it operates. Discussion of the general budget is followed by a closer look at the FHP in the CAF.

Colombia is one of the oldest democracies in the Americas. Regular transitions of power between successive administrations have facilitated the Government's ability to maintain economic stability, in spite of problems associated with guerrilla and drug trafficking activity.

Colombia's economy is market oriented. Traditionally agriculture has played a large role in the economy, accounting for approximately 22 percent of the Gross Domestic Product (GDP). The Government is active in the exploitation of natural resources, as well as in the telecommunications, electricity, and railroad industries. Real GDP has been estimated to grow by more than 3.6 percent in recent years. Inflation, as measured by the Consumer Price Index has been decreased from 32 percent in 1990 to 22 percent in 1994, and efforts continue to reduce it gradually in order to minimize the impact of such reductions on economic production (Ref. 26, p. 9).

The Constitution of 1991 sets forth the structure of the Government and the division of powers between the executive, legislative and judicial branches. The Constitution emphasizes Government decentralization and strong congressional power. The Congress is responsible for the making of laws and exerting political control over the administration; it is composed of two chambers, the Senate and the House of Representatives. The executive branch is headed by the President and includes a Cabinet of Ministers. Justice is administered by the Supreme Court, the Council of State, the Constitutional Court, and judges under a Supreme Judicial Council. A General Comptroller has been established to monitor the fiscal performance of the administration.

## **A. THE BUDGETING PROCESS**

### **1. Constitutional Provisions**

The President is responsible for ensuring the collection and management of revenues. He organizes public credit, modifies tariffs, controls foreign trade, and intervenes in financial, stock-exchange, and insurance activities. It is also the responsibility of the President to prepare the National Plan for Development and Public Investment, and to send it to the House of Representatives together with the Budget of Revenues and Expenditures for the following fiscal year.

The Congress approves the National Development and Investment Plan and determines the resources and appropriations authorized for its execution. Through annual acts, Congress establishes the estimated national revenue and spending measures.

The National Plan for Development contains a Plan of Investment for every institution in the public sector, including the Ministry of Defense. In addition, long-term goals and objectives are formulated. The Public Investment Plan includes the budgets of the main programs and projects for national investment for future years, as well as the financial resources required for their execution.

Every year, within the first ten days of the legislative session, which start on July 20th (Colombia's Independence Day), the Government must present the estimated revenues to be collected and a proposed Bill of Appropriations--collectively known as The Budget Package. This budget contains all of the expenditures for the following fiscal year, beginning the first day of January. If expenditures surpass revenues, the Government submits another package which explains how the reported excess expenditures will be financed.

The Economic Issues Committees of the Senate and the House of Representatives together initiate floor action on the bill until agreement is reached, when the results are returned to each House for final floor votes. The budget can be approved without including the measures for additional sources of revenue required by the Government, which may be approved later on in the form of Supplemental Acts.

Failure of Congress to pass the Budget and Appropriations Act by November means that the budget presented by the Administration will be enacted as it was submitted to Congress. If the Administration does not present the Budget Package within the prescribed time limit, the budget for the previous year is repeated, and the Administration is required to adjust spending accordingly.

Once the bill has passed through both Houses, it is sent to the President for final action. If rejected, it goes back to Congress and the resulting document approved after a second debate must be signed by the President. The Act that approves the budget and sets the appropriations also establishes the rules for programming, modifying, and executing the budget. Once the budget is approved, subsequent expenditure increases (but no reductions) are enacted by Congress as budget amendments.

After the first six months of every fiscal year, the President sends to Congress the Balance of Public Finance, revised by the General Comptroller, in which he informs them of the results of budget performance.

The Government's budget process is established in the Constitution and in the Budgetary Act of 1989. The budget system is composed of a financial plan for two or more years, an annual investment plan, and the annual budget of the nation.

The annual budget of the nation consists of the Revenue Budget, which contains the estimated receipts for the following fiscal year, and the Budget of Expenditures (or Appropriations Act), which comprises the authority to fund the institutions of the State, discriminated by Support Expenditures, Debt Service, and Investment Expenditures.

The principles of the budgetary system are: planning, annuity, universality, funding limits, integral planning, specialization, and Equilibrium (Ref. 27).

*Planning.* The budget reflects the plans in the long run, medium range and short run.

*Annuity.* The fiscal year begins the first of January and ends the 31 of December of every year. Budget authority not obligated during this period, expires and may no longer be used to incur in new obligations.

*Funds Unity.* From the collection of the revenues and capital funds, the money is allocated to public institutions in order to insure the timely payment of obligations.

*Integral Programming.* Every budgetary program must consider the expenditures for investment and support, according to technical and administrative requirements.

*Specialization.* Appropriations must be referred in all public institutions as accounts, in agreement with their objective and have to be executed on the purpose for which they were programmed.

*Equilibrium.* The Budget of Expenditures or Appropriations Act is based on the Budget of Revenues and both must be balanced at all times.

## **2. The Ministry of Defense**

The budget for the Ministry of Defense forms part of the Government budget presented by the President to Congress. It is included within the expenditures proposed for defense and national security, which also covers other agencies, such as the National Police and the Department for National Security, classified as independent sections for budgetary purposes.

This budget is divided into three main components: the budget for support of operations, the budget for debt service, and the budget for investment. Each of the components are further divided into programs that represent similar activities to accomplish particular proposed goals. Within the programs, there are projects that refer to activities related to specific objectives. The Appropriations Act divides funds into accounts called budgetary articles, for purposes of control and classification.

The budget of the Ministry of Defense includes funding for the Superior Direction, the Joint Staff, the Forces (Army, Navy and Air Force) and the administrative units that are under the responsibility of the Minister of Defense.

Personnel services account for 54.6 percent of the allocated budget, and cover the cost of pay and benefits for uniformed and civilian personnel (Ref. 28, p. 211). General expenditures provide resources to operate and perform regular maintenance of equipment and facilities. Transfers are oriented to cover the payment of civilian pensions and other

security benefits to external agencies. Investment resources are intended to pay resources of capital to increase the operational capacity of the corps.

Equipment acquisition refers to all inventory goods, from armament and ammunition to furniture and office equipment. Supplies and Materials include all consumable elements required for operations. Special projects are intended to improve the capability of the elements of the forces, and include modernization of major items and enlargement of facilities and equipment considered critical for readiness. Military housing is included within the appropriation for military construction. To include any project in the investment budget it is necessary to obtain the previous approval of the National Planning Department. The projects must be in accordance with the National Plan for Development and Public Investment and they should be entirely justified, describing the social benefit provided.

The budget process involves the participation and coordination of all government ministries and agencies. The Minister of Finance prepares the revenue and expenditure bill that sets forth the consolidated budget for Government and public sector agencies.

In July of each year, after the projected budget has been presented to Congress, the Ministry of Finance sends out the guidelines to prepare and present budget requests to all public agencies. This set of guidelines is intended to create requests for the fiscal budget two years in advance. These instructions include the projected indexes to apply on each particular line item within current accounts or new accounts defined in the document, taking as a base line current prices at the moment of performing the calculations.

In the case of Personnel Services, all the computations are made on the basis of current endowment and any increase must be obtained through special authorization. For the General Expenditures title, bounds are set by taking the total amount of the appropriations authorized in the present year and applying to it the projected index for inflation. The section heading Investment is restricted by a given topline, and proposed expenditures must be in agreement with the National Plan for Development; only

previously approved projects can claim financial resources, and those which are already in development have priority over any new project (Ref. 29).

Once the Minister of Defense (MOD) receives the guidelines from the Ministry of Finance, the Planning Office has responsibility of implementing the principles with which to program the budget, following the policies defined by the MOD.

By August, the MOD issues a directive to the different agencies and forces, imparting internal instructions on preparation of annual budget estimates. Based on the assessment of threat, and with recommendations prepared by the Joint Staff, he establishes overall priorities for force structure and a minimum level of readiness. This document contains directions for acquisition and major maintenance of equipment and facilities during the following four years.

Each military service prepares its own directive assigning responsibilities to the Chiefs of Staff at the headquarters level for compilation and revision of the data later submitted by the operational, logistics, and services units. No particular programs are identified for consolidation in the budget. The structure of the package is oriented by type of function and close coordination is essential to match the objectives and resources under each administrative branch of every branch of service. Nonetheless, all budget proposals must be submitted to Congress in the budget account format.

At the Unit level, the size of the budget is constrained by the fact that a Unit's Commanders can obligate a limited amount of money, as the ability to sign contracts is restricted to the Minister of Defense, and delegation of that responsibility is limited to specific commands and items. The requirements at the Unit level refer only to minor acquisition, operational maintenance, and public utilities expenditures. Requests for other funding must be made to the Chief of Staff at the headquarters level. Most units try to include an amount of reserve in each line item to guard against future cuts.

The budgets from the Units are consolidated and submitted to each Force Commander; summaries are provided with detailed justification and backup data. These requirements are consolidated at the Staff level, and included into the proposal prepared

for the Force Commander, who verifies the enforcement of MOD policies. At this point, the budget requests are adjusted to reflect spending limits.

By January of the following year, the adjusted budget is submitted to the MOD, together with an additional package of requests that did not fit within the limits of spending, but are considered essential for operations and achievement of proposed objectives. The adjusted budget is presented to the MOD for review and revision, while the additional requests package is almost always presented to the Minister of Finance without revision.

In March, at the Ministry of Finance level, if no resources have been left available from other government agencies, the additional needs form part of one supplemental budget request to be submitted to Congress after the fiscal year has started on January 1.

Execution of the budget is achieved through allocation of funds according to a Disbursement Plan prepared in December before the fiscal year begins. The Government's agencies present their monthly program of expenditures to the Minister of Finance and, compared to the flow of revenues expected to collect, funds are made available on the basis of priority to support Personnel Services, contractual obligations, and General Expenditures. If funds are not paid by agencies within the anticipated term, that amount of money will be decreased in the next allocation, when collections do not suffice in relation to requirements.

When money is obligated but goods and services are not received by the end of the fiscal year, a Reserve Fund, which remains available during the following year, is established (Ref. 27, p. 28). This insures payment for contractors once materials or services are received, but if goods or services are not collected by the end of the extended period, supplemental authorizations must be approved by Congress.

## **B. THE BUDGETING PROCESS AND THE FHP IN THE COLOMBIAN AIR FORCE**

At the Air Force level, the budget process begins when the directive defining the policies and the guidelines on budgeting is received from the Minister of Defense. The

Air Force Commander appoints the Air Force Chief of Staff (AFCS) to prepare the budget request that will be submitted to the MOD by January of the following year.

The AF Commander, with the assistance of AFCS, issues an internal directive establishing the norms and criteria for programming, scheduling, and presenting the Air Force budget. This directive makes reference to the current norms and regulations to be followed during the budgeting process. It reinforces government and ministerial policies about economic trends and defense issues, and sets the procedures to be followed at the headquarters level and subordinate units.

In the case of the 1996 budget, the directive emphasizes that planning must be done in agreement with the National Development Plan, the Strategic Plan Against Violence, and the Five Year Defense Plan formulated by the government. At the Unit level, it requires one to take into account the need to deliver demands that are adjusted to the national reality, based on historical trends, and subject to priorities previously determined by the Ministry of Finance. For 1996, the total amount for operations is restricted to the budget allocated in 1994, adjusted by the inflation index in the following years. Other needs are to be submitted as an additional budget, subject to approval of complementary appropriations by the Congress (Ref. 30).

## **1. Needs Analysis**

The flight operations budget in the Air Force does not really work as an independent program, though provisions are made to handle it separately from other operational activities. The presentation of needs by operating units and administrative agencies follows the format of budgetary accounts defined in the Appropriations Act approved by the Congress. The main elements considered when developing the package for flight operations are included under the Supplies and Materials article for POL and other consumables, and under the Maintenance article for general repairs, spares and parts. Major maintenance activities, such as overhaul of engines and aircraft or construction of maintenance facilities, are included in the Investment portion of the budget.

At the AFHQ level, several agencies under the direction of the AFCS have to deal directly with development of needs. Within the Planning Staff, the Personnel Department determines the number of students that will be incorporated to the military academy following the guidelines established by the Air Force Commander, that figure constitutes the basis for allocating hours for basic training. The Operations Department, based on the threat assessment developed by intelligence, provides a formulation of force requirements to accomplish the Air Force Mission, which in turn will be considered by the Chief of Air Operations when instructing the operative units for preparing flying hour demands.

When preparing demands for flight hours, operating units take into consideration the mission tasks to be performed, the number of aircraft, and the number of aircrews assigned at each location. There is no particular formula to correlate these factors, nor a directive or written document that provides instructions on a procedure to calculate this input (Ref. 31). The main objective is to train and maintain the aircrews at the level of training and proficiency established by the Chief of Air Operations for each type of aircraft. The references at this stage are (1) the training events established to form proficient aircrews; (2) to allow aircrews autonomous by flying at least the minimum number of hours established to operate within safety conditions; and (3) to attend the combat operational missions as required by the Joint Chiefs of Staff.

The number of flight hours estimated by the operating units for each type of aircraft is submitted to the Chief of Flight Operations for approval and consolidation. At this point, the training and operations staff compare the figures to the number of flying hours allocated and flown during the last two years for consistency, and to identify any major deviation in the proposals. Once the forecasts are validated, an increment of five percent is added to those type of aircraft expected to be involved in joint operations with other forces, as formulated in the policies to confront both internal and external threats. The results are submitted to the AFCS for approval and further to the Air Force Technical Chief (AFTC) for financial quantification (Ref. 31).

## 2. Quantification of Demands

Determination of the required dollar amount for the FHP is obtained from the proposed number of flying hours multiplied by the FHC for each type of aircraft. To develop the FHC, in 1993 the AFTC developed a formula based on the following cost factors: (1) POL; (2) airframe maintenance; (3) engine maintenance; and (4) periodic components change. The last three of these items include scheduled and unscheduled activities. These costs exclude payroll for aircrew and technical personnel, ground support equipment, insurance premiums, depreciation, and airport on-transit services (Ref. 32).

Scheduled costs comprise the cost of components replaced when the aircraft go through programmed inspections or the repairing cost in the case of engines going through overhaul; likewise, periodic components for change are determined, and each cost factor is divided by the number of hours for every period to obtain the corresponding per hour cost.

Unscheduled costs are calculated as a percentage of the scheduled maintenance cost for each type of aircraft, based on figures analyses performed on statistics supplied by maintenance squadrons. The percentages are computed once, and they are intended to be applied without modification.

Finally, POL costs are derived from the total of POL supplied to each type of aircraft, divided by the number of hours flown during the year, and multiplied by the gallon price. The resulting computation can be summarized in the following formula:

$$CPH = \left[ \frac{AI_1}{HI_1} + \frac{AI_2}{HI_2} \dots \right] [AU\%] + \left[ \frac{EI_1}{HE_1} + \frac{EI_2}{HE_2} \dots \right] EU\% + \left[ \frac{P}{H} \right] + \left[ \frac{POL}{FH} \right]$$

where:  $AI_i$  represents Aircraft Scheduled Inspection<sub>i</sub> Cost.

$EI_i$  Engine Scheduled Inspection<sub>i</sub> Cost.

P Periodic Components Replacement Cost.

$HI_i$ ,  $HE_i$ , H, FH represent the number of flying hours considered for each particular case.

AU%, EU%, PU% are the unscheduled percentage to apply on the aircraft, engine, or periodic factors.

Costs are to be updated annually in the month of December by applying the inflation index over each factor. The computed costs are to be applied for one year.

Once the flying hours requirement has been quantified and translated to dollar value, it is verified by the Logistics Planning Department to ensure that budget estimates are executable and in agreement with defense guidance, decision documents, and logistic plans for the Air Force.

Furthermore, the Budget and Financing Department collates FHP requirements with other inputs into an Air Force Budget, assuring that there is financial feasibility and balance. At this time, the requests are broken down into two packages; the first contains the needs meeting the basic quota established by the MOD, and the second comprises those demands that will be proposed as an additional budget (Ref. 30).

The Air Force Commander conducts a budget review together with the AFCS and those agencies involved in the budgeting process at the headquarters level. After deliberation and agreement, the consolidated budget in the form of two packages is submitted to the MOD.

### **3. Executing and Implementing the FHP**

Once the budget goes through the steps described above, and formal approval has been granted through the Appropriations Act, the authorized funds are transferred for allocation and execution. When the authorization notice is received by the Air Force, the Air Force Commander, based on recommendations supplied by the Operations and Technical Chiefs, issues an allocation notice to all executing units. The criteria for allocation of funds is driven by mission tasks priorities (Ref. 33).

Most of the flying hour budget is executed through centralized procedures. The operational units are granted reduced allocation of funds, since capability for contracting is restricted to headquarters echelons. Thus, financial resources available for obligations

are administered at the discretion of those who are “at the top”, evaluating readiness and attending to the requirements developed by the operative units.

Measures of FHP performance are related to aircraft readiness and ability to manage allocated funds. The first indicator is given as a percentage of the aircraft available to fly in relation to the total number of equipment assigned to a particular unit. Force readiness is then reflected in the total amount of aircraft ready to operate at a given moment. In this sense, proficiency of aircrews is taken for granted as long as aircraft are ready to fly in safe condition.

The second major indicator is evaluated in the competence to spend. The combination of little money and large uncertainty causes individuals to use up resources quickly, so that they can not be claimed to be overfunded. Moreover, only small amounts of money can be held in reserve for contingencies, as demands always surpass the allocation of funds. Another pressure comes from the fact that unused resources will have to be returned at the end of the fiscal year and the corresponding amount will be removed from the budget for the following budgetary cycle.

The time frame for spending resources is a major restriction when acquisition or repair takes a period longer than that defined in the budget cycle. It should be recalled that obligations must be in effect during the first year, and goods and services have to be received by the end of the following fiscal year. Due to the limited inventory stock, the complex process established for contracting and procurement, as well as the lead-time required from contractors to supply some critical and expensive items, the system requires reliable methods to predict executability of funds in the most effective way.

In general, the program shows a lack of tools with which to coordinate and integrate supply and maintenance procedures for meeting the needs submitted by the operative units. It is more dependent on the judgment and experience of the people involved at all levels than on reliable data and quantitative methods to analyze and forecast demands, and subsequently to relate them to spending programs.

Although there have been several initiatives to introduce information technology to coordinate and speed up the logistic process, results have not increased the capacity for

making decisions concerning allocation of resources. There is only one Air Force-wide automated system that is oriented toward management of supplies and AVDLRs. However, the capacity to maintain inventories and keep track of requisitions is affected by the accuracy of the data manipulated throughout the system.

Despite the fact that submitted requirements are associated with each particular T/M/S aircraft at the unit level, a problem arises when defining the items to be purchased at AFHQ level and associating the complementary items required to perform maintenance tasks. Another problem comes from trying to establish updated prices and procurement time for the items requested. Furthermore, feedback information regarding parts availability is not provided to subordinate units. This fact causes duplication of requests that result in confusion and inefficient use of funds.

Maintenance, flight operations, and budgeting processes work based on manual procedures supported by isolated personal computer systems developed mainly at the AFHQ level. The main efforts have been directed to solve issues concerning summarized data collected manually on a monthly basis. Automated maintenance systems are used to project periodic and hourly inspections for the aircraft. Flight operations systems keep track of the hours flown by each crewman and support decisions on training requirements to get proficiency on every type of aircraft. Finally, automated budgeting systems are employed by the Budgeting and Financial Department to record obligations, payments and status of funds by major account. In brief, the automated systems developed are not integrated to share the information, in order to provide consolidated reports for decision making with the opportunity required for effective planning and management of resources.

The outcome derived from the FHP is evaluated on the number of hours flown. There is no measure to relate dollars spent with performance improvement attained by aircrews. The main indicator is the number of aircraft ready to fly and the number of hours available after the maintenance activities have been accomplished. Arguments to justify any increment in funds are related to the number of hours flown in previous periods and the number of missions achieved through them.

The system lacks more effective evidence to demonstrate the relationship between dollars spent and other factors. Although proficiency of pilots is evaluated through the training events that they must perform to obtain a mission ready status, the results are not associated to the money required for such training. In the same way, there are no means by which to analyze and validate the correlation between maintenance activities and supplies and the funds applied. Overall, more than the trend for number of flying hours needs to be established to relate dollars with quantitative and qualitative measures of performance that will allow decision makers to be aware of the impact and consequences of restricting the resources claimed to accomplish the Air Force mission effectively.

## **V. PROPOSED MODEL FOR THE COLOMBIAN AIR FORCE FHP**

The purpose of this chapter is to delineate an approach to improve the current budgeting process for the CAF FHP. It is not intended to give a detailed solution of how the budgeting process should be, but to suggest an intervention over an issue that can become the starting point for a strategic planning process over the most fundamental issue: how to fulfill the Air Force mission in the most effective way with the primary means available to it. The first section presents the overall approach for improving the budgeting process, including the assumptions at work, the environment in which the FHP exists, and the organizational mission that fuels the need for an efficient budgeting process. The following section of this chapter outlines the necessary steps in optimizing the budgeting process and addresses several specific areas to be developed in implementing the eventual program modification.

### **A. PLANNING APPROACH**

The approach will be driven by the theory about strategic management to which I was introduced by staff of the NPS. It will consider the relationship between the input, given as a level of funding, and the output expected from it in terms of performance readiness, when applying a model that integrates the organizational factors-structure, tasks, people, technology, and systems/processes in the CAF (Ref. 34). In this context, special attention is required in the planning phase of the budget process while allocating and coordinating resources.

Any alternative to choose from in the decision making process is restricted by the funds available. And budgeting, in my view, constitutes the main point of support to achieve effectively any proposed goal over a period of time. For this reason, how to improve the budget process for the FHP will be considered the basic issue to resolve, in order to define and project realistic goals over time. As an issue, it is subjective and intended to bring about conflict and discussion that eventually can result in a practical

decision likely to be " politically acceptable and technically workable; in accord with the organization's basic philosophy and values; and morally, ethically, and legally defensible" after reaching agreement (Ref. 35, p. 139).

## **1. Assumptions**

In developing alternatives for the improvement of the FHP in the CAF, it is possible to rely on several assumptions:

- There are similar principles, goals, and structures, between the air components of the US armed services and the CAF, which make it possible to identify measures at work in the US that are suitable for application in Colombia.
- There is an interest in improving the current budgeting process in the CAF, and there is an organizational willingness to consider variations and to experiment with a new approaches.
- It is possible for decision makers to agree on the objectives and actions required for a successful implementation of the FHP.
- The mechanisms required for implementation of the FHP in the CAF exist or can be developed.

While some or all of these assumptions may be accurate at the present time, it may be that further effort is required of the organizations and key individuals involved to establish an environment in which all of the assumptions are valid. This is normal activity in the environment in which goal-setting and decision-making take place.

## **2. Environment**

It is necessary to consider the characteristics of the environment in which the FHP must function. To formulate an effective FHP model, attention must be paid to government policy and economic and social trends. Such issues define the interests and expectations of the stakeholders in the CAF budgeting and planning processes.

Fundamental decisions on the use of force against any internal or external threat are made by the President, supported by the cabinet of ministers, and subject to political consideration and approval by Congress (Ref. 36, p. 81). Thus, Air force activities, independent or in coordination with other forces, serve as a means of implementing those

political decisions taken at the highest level of the administration responsible for representing the public interest.

The legal rules and procedures for budgeting defined by the Constitution are mandatory, and any initiative must comply with its established requirements. Therefore, the FHP model must consider the norms, steps, and schedule provided for in the national budgeting process.

In review, there is an initial appropriations law, followed by supplemental appropriations every fiscal year. The initial authorizations for the General Expenditures part of the budget cover the basic quotas established by the Ministry of Finance, adjusted for inflation. Supplemental appropriations are then subject to the collection of revenues and are distributed according to the requests made by participating organizations. Maintenance of public order in special situations and measures necessary to respond to external threats are also provided for by these supplemental appropriations.

The budget for investment, on the other hand, is framed under the government national development plan, which is structured for a four year term. The investment budget includes acquisition of new equipment and major repair of airframes and engines, and is primarily financed by external credit. Since Colombia has met its external financial obligations on time, it is reasonable to expect that this method of financing the investment budget will continue.

Threats being dealt with at the current time include those deriving from guerrilla and narcotics trafficking activity. The investment in new equipment required to sustain the containment of such activity will necessitate more efficient mechanisms for ensuring fiscal responsibility and effective use of funds. In order to maintain air combat capability, proper response to threats is subject to proactive planning and action. This planning and implementation is the way in which the Air Force responds to its stakeholders.

External aid is of major influence in the budgeting process within which FHP must exist. External aid can lead to uncertainty in the budgeting process, as the resources that are used to derive equipment and logistical support are subject to the discretion of the

overseas partner. It is therefore necessary to create provisions to maintain an appropriate stock of parts and supplies with which to operate once a given aid package is exhausted.

All of these factors combine to produce the environment in which the Air Force must receive input and produce output to the satisfaction of its stakeholders. Some stakeholders must have the information to plan, while others are dependent on the security derived from the readiness of the CAF.

### **3. Organizational Mission**

The basic mandate assigned to the CAF is given by the National Constitution: to provide for the national defense together with the other Armed Forces. The armed forces are to guarantee sovereignty, independence, and territorial integrity, as well constitutional order (Ref. 36). The Air Force, in particular, exerts national sovereignty by controlling the territorial air space, by performing the tasks assigned within the plans for internal and external defense, and by cooperating in the government's socio-economic plans for development (Ref. 37).

To accomplish these tasks, the organization must ensure availability of proficient aircrews who are ready to fly aircraft. This level of readiness is, in turn, dependent on the availability of funding. For this reason, inclusion of the FHP in the CAF budgeting process can provide a foundation upon which to provide for accomplishing the Air Force mission.

## **B. FRAMEWORK OF THE MODEL AND ITS COMPONENTS**

Development of a model for the FHP program involves several key objectives. It must be possible, for instance, to establish measures for relating the level of readiness to the level of funding provided. This is a key criterion, as the lack of such measures will prohibit the evaluation of the program's performance.

Another objective of the FHP must be to quantify and adequately express the needs of the various organizations within the CAF. Mechanisms must exist within the program to weigh the level of risk associated with a need against the appropriations necessary to respond to that need. In this manner, decision makers will be supplied with

the tools necessary to effectively formulate plans to provide for improved operational capability over time.

An effective FHP will allow the CAF to submit requests for appropriations that are justified within the overall program. This will increase the credibility for funding requests made by CAF organizations by supporting funding requests with quantified measures of needs, appropriations, and resulting readiness that are uniform across the air combat force spectrum.

Because the FHP incorporates information from all levels of operations, it will be necessary to obtain the effective participation of personnel involved at all stages of the FHP process. Formulation of needs, allocation of funds, execution of the program, and evaluation of ongoing results are all activities in which the knowledge of involved individuals is essential in building effective systems and processes.

The FHP process should allow for the control and evaluation of budget formulation. It will also provide a system within which to correct ineffective processes, as well as revise appropriations requests during the budget process itself.

Key to the development of an effective FHP will be the establishment of information systems that provide timely, accurate information. Information systems will enhance the ability of personnel at all levels to perform. While planners will benefit from the increased availability of information upon which to base requests and decision makers will be able to rely on that data in support of their positions, line personnel will have the advantage of communicating information from the operational level.

## **1. Planning**

"The budget can be, and should be the center of policy formulation and implementation." (Ref. 38, p. 40) "The solution for budgeting is planning." (Ref. 39, p. 20)

The keystone of an effective Flying Hour Program is the creation of an effective planning component. Indeed, the budgeting process exists to provide planners with a

mechanism to set and achieve goals over the short, medium, and long terms. Essential to the establishment of any program is the initial request and appropriation of financing.

It has been noted that "measurement of output is fairly straightforward in some activities but virtually impossible for traditional functions such as law, enforcement, external relations and national defense" (Ref. 38, p. 36). While this may be true, one of the central purposes of the planning process in an effective FHP is to establish measures of readiness. Such measures are used to evaluate the resulting performance of organizations operating under the FHP.

Readiness measures themselves are derived as a result of existing threats. In other words, planners first evaluate the threats present or anticipated in the operating environment, then create the level of readiness that will be required to meet those threats. In the CAF FHP, the levels of readiness will be measured in terms of available aircraft and proficient crews to operate them.

Once planners have established the level of readiness required to face threats, the next step will be to relate hours spent on training to levels of proficiency. Each aircraft will have a specific mission or missions to perform in the operating scenario that guides the planning process. For each aircraft and mission, planners must first identify the level of proficiency required of the aircrew, and then quantify the training time required to deliver that proficiency.

Planners must also identify key measures of effectiveness for training. Quantifiable results may be obtained from, for instance, bombing scores, training evaluations, and the occurrence of mishaps. As the FHP is implemented, ongoing results in these types of categories will provide planners with the justification for necessary changes in specific requirements, as well as more general factors such as the focus and direction of the overall program.

Developing countries can be subject to a high degree of uncertainty with regards to the ongoing economic, political, and military situation. It has been argued that this uncertainty prevents annual budgets from incorporating reliable predictions (Ref. 39, p. 315-22). This characteristic is real, but the principle purpose of planning and budgeting

is to attempt to mitigate as much as possible the damaging effects of changing circumstance.

In providing a mechanism through which to deal with changing circumstances, the FHP must take proper account of several changing factors. For instance, maintenance plans must report the dollar amounts necessary for their implementation, and these costs must be updated to reflect the changes in the marketplace. Additionally, the time frame for budgeting and execution should consider the lead time required for procurement and repair of weapons systems that carries over the fiscal year. Consideration of such time factors by planners in the early stages of program development can reduce the amount of future cost overruns, as well as the sacrifice of certain systems in favor of other programs.

Key to improving the ability of CAF planners to accurately project expenses over time is the incorporation of projects to acquire new systems. As mentioned before, these kinds of investments are primarily financed through external sources of funds, making it necessary for planners to consider the ongoing availability of such funding. Additionally, the training, maintenance, and operational requirements of new systems must be carefully analyzed to determine the impact on existing systems and the future availability of personnel, equipment, and training resources to support activities. Such analysis will provide the basis for choosing among various investment alternatives.

A final point to be made in regard to the planning process within the FHP is the level of participation required. In order to create the most efficient planning process, it is necessary to obtain input from all levels of the organization. Budgetary pressures arising from lack of funds and uncertainty emphasize the requirement for cooperative efforts.

## **2. Information Base**

The collection and proper use of information is considered a key problem in achieving effective organizational coordination and adaptation (Ref. 40, p. 26). Reliable information is necessary in developing projections, monitoring performance, and evaluating and modifying the budgeting process itself. Currently, information vital to the function of the FHP in the CAF is dispersed through all levels of command and activity.

It will be necessary to centralize this information for the use of planners and decision makers.

Once the information is centralized and processed, it should be made accessible at every level of activity. To ensure that collected data is valid, it will be necessary to enact procedures for verification of data at the point of entry to the system. Databases that hold information regarding maintenance, supply, finance, and planning will have to be distributed to the various levels of operations so that they can be updated to reflect accurate information in a consistent manner both in the field and in headquarters environments.

The volatility of the environment in which the FHP must exist has been mentioned previously. Such environmental factors reinforce the need for accurate and timely information being made available to planners. (Ref. 39, p. 67). The need for exchange of information is especially crucial at two points in the budgeting process: when needs are presented by operational units to planners, and when funds have been allocated for distribution to units. At both of these points, inaccurate or outdated information in the hands of planners may result in waste of funds and/or unavailability of systems.

The ongoing provision of performance data allows trend analysis to be made, and also makes it possible to compare operating characteristics of various types of aircraft and mission parameters. This will eventually result in improved decision making capability by providing leadership with better tools for choosing between alternatives and correlating expenditures to results.

As the performance of the FHP is enhanced at varying levels and locations through improved data collection and reporting, a sufficiency of data will be collected to simulate the entire program. It will then be possible to isolate a given area of operations to see how changes there will impact the entire system over time. The benefits of modeling the process itself include the ability to predict the outcome of changes in personnel or parts availability, procurement of additional systems, and changes in the budgeting process itself.

Building an effective information system to support the FHP will require significant amounts of funding and organizational effort. Every unit involved in the program will require a gateway to the central system. The aim of acquiring data for use must be balanced with the need for appropriate data security measures. There is much to be learned from the employment of automated data collection and reporting systems in the US military, but similar efforts in Colombia must also consider the lack of organizations and individual positions which are exclusively directed at implementing and managing such systems. The eventual implementation of information systems technology in the CAF FHP will require significant adjustments to the use and value of the data collection/delivery systems and the data that they contain.

### **3. Structure**

While some changes in organizational structure will doubtless evolve as the FHP is improved, the impact of such changes on the culture of the CAF should be minimal. Any contemplated changes in structure must be evaluated and implemented or rejected by the existing command hierarchy.

The only significant changes in structure that should be anticipated at this point are the establishment of positions at various levels of activity to manage the data collection and dissemination process and the establishment of a central body to oversee the implementation of the FHP. Such a central office to manage and execute the FHP is required due to the need to coordinate cross-functional activities and to present comprehensive responses to changes in the internal and external situation. A FHP management office would be responsible for determining the feasibility of executing proposed plans and programs, and the primary tool used in making such determinations would be the information base developed through the collection and evaluation of data over time. Located in the Air Force Headquarters, the FHP management office would be closely linked to the Chiefs for Operations and Technical Support and the Financing and Budgeting Department.

The central FHP management office would also provide for the development and ongoing maintenance of the information systems equipment and personnel that would be dispersed throughout the units of the CAF that are concerned with maintenance, supply, financial, and flight operations activities. The central office would develop the procedures to be used in implementing the FHP, and would modify them as necessary.

Whether to establish new departments in operating units to handle information systems or whether to assign such activity to existing departments will have to be determined by FHP planners. The criteria should be the ability of such personnel to provide for the integration of data from operative and financial functions and transfer the data from decentralized locations to management within the AFHQ in a coherent form.

#### **4. Needs Analysis**

"Regular communication and cooperation between budgeters and planners is needed to avoid confusion, waste and frustrations." (Ref. 38, p. 41) Development of the budget for the FHP implies incorporation of Air Force flying plans for a definite period of time -- the fiscal year. Nonetheless, the time frame for submission of requests demands that certain needs be predicted more than one year before execution is to begin. This necessitates that planners must establish procedures for considering needs outside of the fiscal year budgeting process.

As scarcity of means to face threats is prevalent, forecasters must start to determine what the availability of aircraft will be. Determination of the amount of aircraft by T/M/S is required to establish their current situation when the process begins and consequently the number of flying hours available from them by that time. Then, it must be assumed that all the hours for the coming year will be funded, authorized, and flown. This calculation gives the situation to expect for each T/M/S at the beginning of the fiscal year to budget.

Once the number of aircraft has been determined, it should be increased with the units that will be incorporated into the fleet. For the resulting number of aircraft, a CSR for each type can be established, according to the required level of readiness and the crew

manning factor to be defined by the Air Force Commander from the Flight Operations Chief's initiatives.

The CSR multiplied by the number of aircraft will give the necessary number of aircrews required for accomplishing the Air Force mission. Comparison of this figure with the number of proficient aircrews that will be proficient or advanced at the beginning of the next fiscal year budget, the number of aircrews and, consequently, the number of training hours may be deduced.

The number of hours required to prepare an aircrew at a given level of proficiency will be given by syllabus training, depending on events defined in training manuals for each type of aircraft. Further, the flying hours required for training will be added to those estimated to accomplish operational missions based on historical records available. This results in the total number of flying hours for the budget year.

After the required number of flying hours for a desired level of aircrew readiness has been established, it can be taken as a reference for determining the requirements for scheduled maintenance. This will allow the prediction of spare parts and repairs required, which in turn will yield a dollar amount to be requested, once a percentage for unscheduled maintenance is applied to each type of aircraft.

Since experience obtained from the FHP in the US armed services reflect FHC variances in some cases, it is assumed that the formula adapted by the CAF in 1993 would result in a significant deviation compared to actual costs for two main reasons: the limited historical data available and the overhaul costs that it includes (Ref. 25, p. 2).

Of course, the procedure requires reliable basic data primarily for pricing; however, such data can be obtained through effective mechanisms already developed in the supply system that can be accessed through the automated systems for managing of the program.

## **5. Control Systems**

The activities to measure and keep track of the FHP development are mainly related to flight operations, logistics support, and finance. All of these areas require the

establishment of standards of performance to compare against the actual outcomes that the FHP will produce.

To perform the comparisons, IS activity should allow the units to report the flight hours flown by individuals and aircraft and the operational missions or training events achieved during a period of time. Additionally, for each flight the POL consumed must be recorded. Likewise, the operational units will record the maintenance activities accomplished and the supplies required for each T/M/S. Minor expenses incurred with O&M funds allocated to the units will be submitted monthly indicating the type of equipment to which they were applied.

At the AFHQ, the system provides information about the obligations incurred to attend the supply requirements formulated by the operational units in order to execute the maintenance activities on each particular aircraft. This data will be collected from the supply centers, requiring replenishment of stock inventories at the moment the requisitions are made.

From the data submitted by operational and logistic units, the training plans, and the budget allocations, the progress of the FHP may be determined at varying points in time. The results from comparisons will allow managers to detect variances and take corrective action during execution.

In the financial area, the results are intended to provide a means to insure that financial transactions are not incurred in excess of funds available, to verify that funds are used for the purpose for which they were appropriated, and to manage shortfalls and excesses by reallocation of funds among type of aircraft.

Furthermore, comparison of proposed objectives with actual results allows for support of subsequent requests during the fiscal year in the form of supplements. Through timely statistical reporting of receipts, expenditures, and cash balances for comparison with goals and objectives achieved, the system will provide a measure of budget performance and facilitate management control reports to assist the decision makers in evaluating the effectiveness of the FHP as a whole in accomplishing the Air Force mission.

Finally, evaluation will serve to monitor the adequacy of controls and quality of procedures. More importantly, the evaluation will serve as a basis upon which to assign incentives and rewards for those responsible for preparing the planning and execution of activities in conformity with the policies established and the resources allocated to them.

## **6. Personnel**

One provision for effective implementation of the FHP model refers to development of analytic staff at each location where the program is to be managed. This can be accomplished by strengthening the present budget staff and recruiting and training new personnel with specific characteristics.

Analysts should have knowledge of economics, budgeting principles, statistics, and the management process in the public sector (Ref. 2, p. 193). Managers will require motivated staff to assist them in the interpretation and manipulation of data, but will nevertheless require a comprehensive understanding of the program and how the various elements fit together. They must be able to understand and to use the products of analysis in the decision-making process.

Analysts and managers have to be able to communicate and identify with each other when discussing alternatives or interpreting results. The intention should be to focus on training the people on what can be done in limited amounts of time. A training program must consider analytic techniques applied to the type of problems confronted in the allocation of resources, as well as application of automated information systems that support the program.

Though individual skills can be developed and improved through experience, deficiencies that affect performance must be corrected through short-term training. The combination of managers and analysts can only be effective if they have common grounds of understanding and a language in which to communicate.

## **C. TRANSITION AND INTERVENTION**

Proper adaptation of the principles outlined above requires an efficient and effective schedule for implementation. Individuals and organizations within the FHP

must be able to deal effectively with those outside it, and problems relating to implementation of the program, including the establishment of new positions and procedures must be kept to a minimum.

All organizational systems contain parts that perform specialized tasks for the whole. Despite their differentiation, these interdependent parts have to be coordinated to maintain system identity, coherence and productivity. At the same time, the organization has to respond to external threats and opportunities. Managing the part-whole relationship while adjusting and adapting to environmental changes makes the planning process, especially its coordination difficult (Ref. 34, p. 8).

The planning process could be developed under an approach which facilitates dialogue and deliberation over the needs, goals and objectives to manage in the short and long term. Therefore, implementation should consider a long-range strategic posture of ten to twenty years, plus tactical plans over a three to five year period. Decision makers can consider how the required work is accomplished within certain parameters of performance and what can be the impact on the individuals accomplishing it (Ref. 41, p. 16). An adequate balance should be pursued between individual expectations and organizational mandates to provide consistency and identification of clear objectives throughout the process.

This approach requires reaching agreement between planners and executors, on major subjects concerning the process. First, it is required to identify the goals and objectives to achieve at organizational and unit levels. This step will enable the selection of reasonable alternatives with a high probability of success. Measures of program performance have to be established with provisions for intervention by those who will be affected by the outcomes. Measures of program accomplishments can include responses to combat calls or other types of mission, level of aircrews trained, aircraft availability, hours flown, training records, bombing scores, mishaps, maintenance activities, inventory stock levels, funds obligated, or other outputs representing the product of allocated funds as they are spent.

Once the goals and the measures of performance have been agreed upon, the effort can focus on defining budget priorities. This step requires preparation of realistic alternatives to decide where to direct the funds. Negotiation and dialogue with those affected by budget choices, before and after the budget proposals are defined, can result in better commitments. This action implies involvement from the squadron levels up the chain of command, for articulation of needs when preparing the budget.

Budget constraints have to be understood early in the process, and tradeoffs can be made where there is time, concentrating on initiatives and expansions while considering reductions in lower priority packages. The tasks should be arranged in a sequence comprising a schedule of targets to be achieved at specific times. Stress should be placed on estimating the total financial cost of reaching goals (Ref. 1, p. 275). This requires foreseeing obstacles and agreeing on the consequences of actions, taking into account what managers will be able to accomplish if reductions are not made or what impact on program performance will cause any reduction from the proposed requirements.

The last step, program evaluation, is considered as "the systematic measurement of program performance, the making of comparisons based on those measurements and the communication of evaluation findings." (Ref. 42, p. 47) This step is intended to provide enough information to measure the progress in a uniform way, and to decide whether to redirect or expand the program.

If measurable goals, budget priorities for allocation, and execution of activities have been defined in advance, then everyone can be aware of what is expected and act appropriately. The intended purpose is to build up credibility from the inside, providing information at each stage about program costs, activities and results, understanding the implications for every action, and assigning responsibility for the resulting consequences in the program performance as reflected in an appraisal system where rewards and penalties are clearly defined and understood.

In the same manner, provisions should be taken for training and preparing qualified personnel with a clear understanding of the aims and methods utilized to reach

them. This includes the selection of appropriate decision units within the process, empowering them with authority and information for fast reaction. For this purpose, workbooks and other educational materials must be prepared to train the participants in workshops and presentations oriented to bring out discussion. At the end, each role and responsibility should be clearly defined as a result from the negotiation and compromise gained from the deliberation process.

Finally, it will be necessary to consider contracting consultants with specialized areas of expertise. The experience of these advisors will support development of the process at every stage, from planning to implementation and evaluation. Moreover, the assistance of dependable experts can be relevant in acquainting managers with the methodology to follow, developing skills to use analytical techniques, and providing advice on the choice and use of the information systems that will support the program.

Implementation can be projected in a gradual, continuous, and progressive way. According to the experience observed in the US Navy, modifications in the FHP have been successful when limited implementations take place at test locations (Ref. 6, p. 34-40). Once the discussion and improvements on the present program are reached, implementations may be made in a particular air command to monitor effects, carry on reviews and improve the mechanisms for a better implementation of the program at the organizational level. This recalls the thoughts of Robert Behn, who has said, "the public manager cannot develop the perfect plan from the beginning. Rather he or she must experiment with various initiatives, trying to determine what works closer to his goal, create new capabilities for his organization, and help to motivate his staff by demonstrating that they can be successful." (Ref. 43, p. 643)

## **VI. CONCLUSION**

### **A. SUMMARY OF FINDINGS**

#### **1. US Air Components**

An effective Flying Hour Program can be a crucial tool in helping the air force component of a military organization meet its objectives. Such a program is fundamental to effective operations because it allows an organization to plan for the ultimate mission of air security by considering the myriad operational details and environmental factors at work. By quantifying each hour of air service time in terms of the total cost required, planners have the benefit of being able to develop responses for projected situations, and decision makers are provided with the ability to gauge the fiscal impact of operational decisions and the operational impact of fiscal choices.

In reviewing FHPs in the US military, it should be noted that each military service uses a different method for determining flying hour requirements. Even so, all of the US services rely on training as a basis for determining combat readiness of aircrews and projecting needs of flying hours for each budgetary cycle. Each service has established a proven structure for developing budgetary needs, providing for justifications, and revising procedures through the chain of command.

It must be recognized that military judgment is necessary in determining combat readiness and aircrew proficiency but, according to the GAO, more emphasis should be placed on developing objective measures of the benefits derived from different levels of training and allocated funds, based on quantitative data supporting judgment and experience. In addition to the military expertise required to determine readiness, it must be recognized that readiness is also a function of several factors, such as funding level, maintenance capability, spares availability, aircrews available, and manning levels, which are constraints in various areas of the governmental budgeting process.

Another key element of FHPs is the use of information systems to manage the data used in the programs. Specifically, the US Air Force and the Navy rely on well

developed information systems that are installed across each service to manage and control the FHP execution, to maintain historical data, and to project the requirements for operation and associated costs. The development of effective IS applications allows for the generation of budgetary and financial reports for control, which in turn provides for effective accounting for funds, ensuring that transactions are executed in accordance with authorizations.

## **2. The CAF**

It has been noted that the Colombian Air Force budgetary process operates under an annual cycle with characteristics similar to that of the US armed services. While the CAF has an FHP in place, it is possible for the process to be improved through the adoption of policies, procedures, and systems integration like that found in the US military.

While some organizational stress is to be anticipated in improving the CAF FHP, careful consideration of the alternatives and consequences involved will allow for the negative impact of such change to be mitigated. As the CAF is already contemplating a movement toward the employment of automated data systems, it is possible that improvements to the FHP itself can occur in relation to implementation of already anticipated information systems. In modifying more traditional areas of the FHP, organizational resistance can be significantly reduced through the use of input from all levels of activity in restructuring the program.

Despite the problems associated with change, it can reasonably be anticipated that improvement of the FHP will allow for the definition of realistic and attainable goals that are well-articulated at all levels of participation. These goals will, in turn, provide a standard against which to measure the organization's ability to meet the mandate of the public to provide for security in a fiscally responsible manner.

It must be stressed that migrating the CAF FHP to a program that more closely resembles the budgeting processes at work in the US will require investment in information systems technologies. Effective implementations of IS will help to improve

the decision making process at all levels, whether they are involved in flight operations, maintenance and supply activities, financing, or reviews of performance.

## **B. RECOMMENDATION**

The Colombian Air Force, like any other organization, can learn and adapt from its own experience; however, the effort required for improvement of current procedures may be reduced by applying mechanisms that have worked in other organizations with similar structures and purposes. It is therefore recommended that the CAF review similar procedures at work in the US, such as those outlined in this thesis, in formulating the key goals and implementation plans with which to improve the FHP. This thesis has highlighted several key factors to be considered. When each of those factors has been addressed, and all of the available information has been digested, it will be possible for planners to construct an effective implementation of modifications to current policies and procedures.

## **C. SUGGESTIONS FOR FUTURE RESEARCH**

While their use is intended to enhance, rather than replace, flight training, flight simulators can be more efficiently used to reduce flying hour costs. It remains necessary to establish the conditions under which these tools are best employed in training programs, as well as how their use can improve the performance and readiness of aircrews at lower cost.

Indicators of performance and other readiness measures require a specific and detailed study to support the necessity of hours required for training. Further research should identify the relationship between hour flown and the level of proficiency derived from them for each type of aircraft.



## LIST OF REFERENCES

1. Wildavsky, Aaron, *Budgeting: A Comparative Theory of Budgetary Processes*, Little, Brown & Co., Boston, 1975.
2. Novick, David, *Current Practice in Program Budgeting (PPBS)*, Crane, Russak & Company Inc., New York, 1973.
3. Jones, L.R., and Bixler, Glenn C., *Mission Financing to Realign National Defense*, Research in Public Policy Analysis and Management; Vol. 5, JAI Press Inc., 1992.
4. Berner, Keith and Dagget, Stephen, *A Defense Primer*, Congressional Research Services, Library of Congress, Washington, DC, 1993.
5. *Practical Comptrollership Manual*, Naval Postgraduate School, Monterey, CA, August 1991.
6. Martin, Edward J. Jr., *From Dollars to Flight Operations: An Analysis of the Navy Flying Hour Program*, Master's Thesis, Naval Postgraduate School, Monterey, CA, June, 1992.
7. Edwards, Michael V., *Flight Hour Costing at the Type Commander and Navy Staff Levels: An Analytical Assessment*, Master's Thesis, Naval Postgraduate School, Monterey, CA, December 1992.
8. Kuhnreich, Jeff C., *Managing the F-14 Flight Hour Budget in an Environment of Decreasing Resources*, Master's Thesis, Naval Postgraduate School, Monterey, CA, September 1988.
9. Murray Michael N., III, *The Marine Corps Flying Hour Program*, Master's Thesis, Naval Postgraduate School, Monterey, CA, June, 1986.
10. Paimann, J.C., Rhodes, R.E., and Wolfe, R.C., *A Comparative Analysis of the Armed Services Flying Hour Programs From a Budgeting Perspective*, Master's Thesis, Naval Postgraduate School, Monterey, CA, December, 1991.
11. McCaffery, Jerry L., *Public Policy and Budgeting (MN-3172 Class Notes)*, Naval Postgraduate School, Monterey, CA, April-June, 1994.
12. Wildavsky, Aaron, *The New Politics of the Budgetary Process*, Scott, Foresman & Company, 1988.
13. US Army Audit Agency, Report of Audit, MW 86-707, *The Army Flying Hour Program*, Washington, DC, June, 1986.
14. Department of the Army Headquarters, Training Circular 1-210, *Aircrew Training Program: Commanders Guide*, Washington, DC, October, 1986.

15. Cordrey, Ted D., LTCOL, US Army, "The Army Flying Hour Program. Is the Prediction Methodology Flawed?", US Army War College, Carlisle Barracks, PA, April 24, 1989.
16. COMNAVAIRPACINST/COMNAVAIRLANTINST 3500.63B, dated May 1992: Squadron Training and Readiness Matrices (COMNAVAIRPAC/COMNAVAIRLANT Report Control System (RCS) 3500-17/3500-38).
17. Blake, William R. Jr., *Fiscal Constraints and the P-3 Flight Hour Budget*, Master's Thesis, Naval Postgraduate School, Monterey, CA, June, 1988.
18. Smith, George, *Management of the Navy Flying Hour Program: Responsibilities and Challenges For The Type Commander*, Master's Thesis, Naval Postgraduate School, Monterey, CA, December, 1990.
19. Bozin, S. D., *Improving the Management Control of Aviation Fleet Maintenance Funds*, Master's Thesis, Naval Postgraduate School, Monterey, CA, December, 1981.
20. Downs, Michael D., *Flight Hour Cost Variance in the Naval Air Reserve: An Analysis of Possible Sources*, Master's Thesis, Naval Postgraduate School, Monterey, CA, December, 1991.
21. Staggs, Karl S., *Aviation Depot Level Repairable Carcass Tracking and Billing: The Effect of the Two Price System of Budgeting and Flying Hour Cost Reporting*, Master's Thesis, Naval Postgraduate School, December, 1991.
22. Chief of Naval Operations, *Operations Plan 20: FY 1989 History Final*, January 26, 1990.
23. US General Accounting Office, *Aircrew Training: Developing Objective Data to Support Flying Hour Programs*, Government Printing Office, March, 1989.
24. US General Accounting Office, *Tactical Air Command and Strategic Air Command Flying Hour Programs*, Government Printing Office, September, 1986.
25. US General Accounting Office, *Naval Aviation: The Flying Hour Program's Budget and Execution*, Government Printing Office, July, 1989.
26. *Colombian Information Report*, Embassy of Colombia, Washington, DC, 1993, p. 9.
27. *Estatuto Organico de Presupuesto General de la Nacion*, Republica de Colombia, Ministerio de Hacienda y Credito Publico Direccion General de Presupuesto, Santa Fe de Bogota, Colombia, 1989.
28. *Ley De Presupuesto de la Nacion 1994*, Ministerio de Defensa, Ministerio de Hacienda y Credito Publico, Santa Fe de Bogota, Colombia, 1994.
29. Directiva Permanente No. 017/90, *Normas para la Elaboracion de Anteproyecto de Presupuesto del Ministerio de Defensa Nacional*, Santa Fe de Bogota, Septiembre de 1990.

30. Directiva Transitoria No. 096/94, *Anteproyecto de Presupuesto 1996*, Comando Fueza Aerea, Santa Fe de Bogota, Novembre de 1994.
31. Telephone Interviews between LTC Gustavo Plazas J., Systems Department Chief AFHQ, Santa Fe de Bogota, Colombia, and the Author, March 8, 1995.
32. Manual de Mantenimiento MM-0-31, *Calculo y Actualizacion Costo Horas de Operacion Equipos de Vuelo FAC*, Santa Fe de Bogota, Colombia, 20 Octobre de 1993
33. Memorandum No. 7994-JET-456, *Informacion Asignacion Horas de Vuelo*, BG Hector F. Velasco Ch., Air Force Technical Chief, 11 Novembre de 1994.
34. Roberts, Nancy C. and Wargo, Linda, *The Dilemma of Planning in Large-Scale Public Organizations: The Case of the United States Navy*, Naval Postgraduate School, Monterey, CA, 1993.
35. Bryson, M. John, *Strategic Planning for Public and Nonprofit Organizations*, Jossey-Bass Inc., San Francisco, CA, 1988.
36. *Constitucion Politica de Colombia 1991*, Presidencia de la Republica, Impreandes S. A., Santa Fe de Bogota, 1993.
37. *Resolucion N. 8817*, Ministerio de Defensa Nacional, 28 Decembre 1990.
38. Goode, Richard, *Government Finance in Developing Countries*, The Brookings Institution, Washington, DC, 1984.
39. Caiden, Naomi and Wildavski, Aaron, *Planning and Budgeting in Poor Countries*, A Wiley-Interscience Publication, New York, 1974.
40. Milgrom, Paul and Roberts, John, *Economics, Organizations, and Management*, Prentice Hall, Inc., 1992.
41. Nadler, David and Tushman Michael, *Strategic Organization Design*, Scott, Foresman and Company, Glenview, Illinois, 1988.
42. Wholey, Joseph S., *Zero-base Budgeting and Program Evaluation*, DC Heath and Company, Lexington, Massachusetts, 1978.
43. Behn, Robert D., "Management by Groping Along", *Journal of Policy Analysis and Management*, Vol. 7, N.4, John Wiley & Sons, Inc., Fall 1988.



## INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center .....2  
     Cameron Station  
     Alexandria, VA 22304-6145
  
2. Library, Code 52 .....2  
     Naval Postgraduate School  
     Monterey CA 93943-5101
  
3. Dr. Jerry McCaffrey, Code SM/Mm ..... 1  
     Department of Systems Management  
     Naval Postgraduate School  
     Monterey, CA 93943-500
  
4. Dr. Kenneth Euske, Code SM/Ee .....1  
     Department of Systems Management  
     Naval Postgraduate School  
     Monterey, CA 93943-500
  
5. Dr. Nancy Roberts, Code SM/Rc.....1  
     Department of Systems Management  
     Naval Postgraduate School  
     Monterey, CA 93943-500
  
6. Lt. Col. Carlos A. Suarez M. ....2  
     Transversal 47#106-39  
     Bogota, Colombia